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## POPULAR AND PRACTICAL ENTOMOLOGY.

### A WEEK'S COLLECTING ON COLISEUM MOUNTAIN, NORDEGG, ALTA.

BY F. C. WHITEHOUSE, RED DEER, ALTA.

A number of years ago Mr. F. H. Wolley Dod gave his experience of a day's collecting on a mountain top near Laggan (Ent. News, March, 1908). In the hope that it may prove of passing interest to collectors, I tell a somewhat similar story.

On the 16th July last year Mr. K. Bowman, of Edmonton, made a trip to the top of the Coliseum Mountain, Nordegg. He took a pair of *Brenthis astarte;* one or two *Papilio zolicaon* and *P. nitra;* took a *Neoarctia yarrowi*, and otherwise satisfied himself that it was a "happy hunting ground." On the 10th August, 1916, I made the same trip. The day was sunny but bitterly cold; however, I took a fine pair of *Neoarctia beani* and several other good things, and I was equally pleased with the promise of the Mount. Since then Mr. Bowman and myself have discussed a camping-collecting trip on Coliseum Mountain every time we met, and in the end we went.

We left Red Deer, 9th July, Alberta Central, 1.30 p.m. for Rocky Mountain House, arrived 7 p.m., spent the night at the Mountain View Hotel, and resumed our journey, C.N.R., 7 o'clock a.m., arriving at Nordegg shortly after noon. Mr. Stuart Kidd of the Bighorn Trading Co. had everything ready for an early start next morning, viz., two pack ponies and a packman, tent, sleeping-roll, blankets, a grub-stake, cook pots and an axe.

Mr. W. Stevenson, of Nordegg, a new recruit to the entomological fraternity, promised to join our party for two or three days; and the plan for the morrow was as follows: We to leave at 7 a.m. hot-foot for the mountain top to scout for water, and particularly a spring that I had found in August the previous year. It was estimated that we could perform our mission and be back at the cliff face in time to meet the packman and his ponies after

their laborious ascent. If water were found we could pack the stuff to the top, and if not, readjust our plans.

Well, we started at 8 o'clock and came upon *Brenthis triclaris*, beautifully fresh, just below the village. On the trail to Mire Creek, *Œneis jutta*, *O. chryxus*, *Colias interior*, *Pieris napi*, etc., were on the wing, and the muskeg teemed with *Phyciodes pratensis* in its infinite variety. Now I have no wish "to split on a friend," but Mr. Bowman, enthusiastic and capable collector as he is, is physically incapable of "carrying on" with anything required to perfect his series flying within a few feet of his net; while as to Mr. Stevenson, absolutely everything was to him pure gold! There were butterflies in the ointment, and the best laid plans came all to grief!

We reached the cliff face two hours late, with "Dutch" and his ponies scrambling up almost on our heels. Assuming that he would wait for our return, we hurried off to look for the spring. We did not find water, but *Œneis brucei*, *Colias nastes*, *Lycœna aquilo* et al., delighted our vision. While returning to the cliff face through a clump of spruce, Mr. Bowman took a sweep at a dragonfly, and passed me his net containing a male of *Somatochlora minor*, and we shortly after took two females of *Somatochlora franklini* (to collect species of which genus was the particular object of the trip so far as I was concerned—though, of course, all desirable butterflies and moths were "good fishing"). From the spruce to where we were to find "Dutch" was not far, and we *found him*, scurrying home through the muskeg, 2,500 feet below, riding one pony and leading the other.

It was 1.30 p.m. We held a council of war.

Clearly "Dutch," tired of waiting for us, and probably quite as thirsty as we were, had dumped the pack and left us to our fate. Water we must have, unless we abandoned our camping scheme altogether—which we were naturally quite determined not to do —but first to find the pack. I suggested that the others go down to where "Dutch" was last seen, search there and scan the cliff face from below, for it was clearly unnecessary for us all to go down if it was to be only a matter of coming up again! They saw the pack right against the cliff about 200 feet east of me around a bend, and I made my way to it while they reclimbed the 500 feet.

Pending their arrival I rescued from a spider and appropriated to my own use a fine specimen of *Anarta cordigera*. Reassembled, we started the descent.

It was at this juncture that Mr. Stevenson discovered (by dropping the blanket pack) that cornerless objects will roll down hill. To confirm this, the tent, dunnage-bag and bedding-roll were despatched on a like course, after which the articles mentioned travelled by the "rolling method" exclusively—with occasional encouragement from the toe of a boot. Arriving at a plateau, it was decided that one of us should explore the bottom of the ravine for water. The others suggested that it was my turn, and I went. The descent was steep and a tangle of deadfall, but I reached the bottom at last. The rocks were dry! I struck off down stream, and within a few hundred feet came upon water—a spring, pure and cold, bubbling over the rocks for a hundred feet or so, and then again losing itself among the rocks. My friends joined me shortly after, and having drunk we decided that we would camp right there at about 5,000 feet. First, however, the outfit must be packed to the spot—terrible thought!

I will skip all that we endured from thirst and weariness for the balance of that semi-tropical afternoon. Let it suffice that we and our belongings were back at the camping ground again by 5 o'clock, and that in less than an hour we had the tent pitched and supper cooked. Here endeth the first day.

July 12th.—By 8.30 a.m. we had breakfasted and commenced the ascent, not on the slope taken the previous day, but that upon which the camp was situated. This proved to be the easier climb in every way—a matter of about an hour or so to the top.

It might be well here to describe briefly the Coliseum Mountain. It is a long mount of 6,500 feet altitude, running east and west, and consisting of three different formations. That to the east, is a long, smooth ridge, flat on top, and having two or three good clumps of spruce on the south side. The western formation is a round peak with perpendicular cliffs and a flat top. Joining the eastern ridge and the western peak, is a huge semicircular amphitheatre of loose shale, facing the south, from which the mountain takes its name. This is slightly lower, narrow on top, and treed with spruce. The highest point of the eastern

ridge is on the north side, nearly at the western end, and this is undoubtedly the best collecting area. The mountain side here is loose shale with a short cliff of four to six feet at the top.

Returning to the insects, on this, the second day, we found *Colias nastes* on the wing, *Œneis brucei* very common, *Argynnis meadi, lais* and *eurynome; Brenthis triclaris, chariclea* and *freija; Erebia epipsodea* and *disa* (the latter rare); *Lycæna aquilo* and *scudderi, Euchlöe creusa, Papilio zolicaon* (2 or 3 only and passé); *Pamphila mandan* and *Hesperia centaureæ.*

Of dragonflies I took *Cœnagrion angulatum, Æshna eremita* and *sitchensis; Sympetrum rubicundulum decisum, Leucorrhinia hudsonica* and, of the genus *Somatochlora*, males and females of *minor*, one female of an undetermined species, but no males to the odd females of *franklini* taken the previous day. We returned to camp well pleased with our catch.

July 13th.—On the top, mostly in the favoured area mentioned above, Mr. Bowman captured 6 of the handsome tiger moth, *Neoarctia yarrowi.* Our party explored to the western peak, and while the trip yielded nothing special, it was a glorious walk, giving a magnificent view of the Bighorn and more distant mountain ranges. On this date I took a male of *Somatochlora albicincta* on the top, and a female of the same on returning to the camp in the evening. This was the fourth variety of the genus in three days. Just before starting the descent in the late afternoon a new butterfly put in its appearance, viz., *Melitæa anicia.*

July 14th.—A glorious hot day, and by 2 o'clock Mr. Bowman had captured three *Brenthis astarte.* We also took four *P. zolicaon*, five *N. yarrowi*, eight *M. anicia*, two *Androloma maccullochi*, and other diurnals previously mentioned.

This was also a good day for dragonflies, as the males of *S. franklini* (quite fresh) put in their appearance. I took four; also males and females of *minor* and a male of *albicincta.*

In the early afternoon Mr. Stevenson, who had to return to Nordegg, bade us good-bye and left on his long tramp home.

July 15th.—Mr. Bowman accompanied me to the top and

caught a few good things, then at noon he also made tracks for Nordegg. Before leaving he explained the method that he had found most efficacious for taking that most difficult of butterflies—*Brenthis astarte*, viz., to wait patiently until the insect settled on one of several pink-flowered plants of *Dianthus acaulis* and then spring! In due course a bright male appeared, and for half an hour I tried Mr. Bowman's method—and every other—in vain. *Astarte* is a peculiar insect—deceptive as to colour, pugnacious as to disposition, and fleet passing understanding. On the wing it looks *red*, due to the rapidly beating wings exposing the undersides. Why it should rush at every inoffensive butterfly that comes near it I cannot say, but rush at them it does. *Astarte* makes its appearance from the shaly slopes and, flying up over the edge of the cliff, rushes round on top for a few minutes attacking every butterfly in its course. Then it tumbles headlong over the cliff, flies along the loose shale, comes up again—and repeats. I watched my first *astarte* do all this many times and inspiration came to me. It flew *slower* when it was over the cliff! Why? Ah, I had the secret, and over the cliff I went myself (almost headlong in my eagerness). There I sat, where the foot of the cliff rose from the shale, net ready, and my eye glued to the edge of the cliff to my right where he would come over. Here he is! Flew right into my net! I give my discovery for the benefit of future collectors of *astarte*. Down under the cliff, both "hunter and hunted" are in the shadow.

At 3 o'clock as nothing much desirable excepting *Colias nastes* seemed to be on the wing, I was inclined to return to camp, but decided that I would first try the second clump of spruce. Well was I rewarded, for there I took a fine, fresh *Erebia disa*—my first of this species—and a pair of *Melitæa anicia* and, returning through the other clump, I captured a dragonfly prize indeed, a beautiful female of *Somatochlora cingulata*—the fifth species of the genus to date! I also took a number of two other varieties, *franklini* and *minor*, and one female of *walshii*.

I returned to camp at 5.30, and amplified tent accommodation was the only compensation that I had for the loss of my two friends.

July 16th.—This day I took a good mixed bag, increasing my Somatochlora series of *minor*, *albicincta* and *franklini*. Two *astarte* were on the wing, a female that I took at rest on a rock, and a male by the easy system practiced the previous day. I also caught one *N. yarrowi*, a fine pair of *Vanessa milberti*, a *S. galii*, two *C. nastes*, two *Œneis chryxus* and saw a *Neoarctia beani*, that I much wanted for Mr. Bowman, flying low over the shale. I walked to the eastern end of the ridge, but a strong south wind was blowing and nothing much resulted.

Mentioning wind, reminds me that a breeze on a mountain top—even on glorious, hot, cloudless days, is the rule rather than the exception, This has evidently created in mountain-top butterflies the protective and pretty habit of lying over on their sides when at rest. *C. nastes* and *O. brucei* are much given to this attitude, but I think all the other species taken adopted it more or less. Even when temporarily there was no wind, or the spot was a sheltered one, it made no difference. Instinct told them to "lie low," and lie low they did.

On returning to camp I saw a largish Somatochlora flying by a jack pine, and netted it successfully when it settled. It proved to be a male, not of the odd female of the 14th (*cingulata*) but a seventh species, viz., *semicircularis*.

July 17th.—This was to be my last day on the mountain, Some time during the morning, i. e., after I had left for the top. "Dutch" was to come up to pack the outfit back to Nordegg. I rose at 6.30 and reached the top at 10 o'clock. Soon after I saw, but failed to capture, a butterfly that I greatly desired, viz., *Papilio nitra*. It flew straight past me just out of reach. I did get, however, a male Somatochlora to pair with the large, white-ringed female of the 15th, *cingulata;* a lot of females of *S. franklini*, and a mixed lot of butterflies that have already been mentioned. At 2.45 I started down for Nordegg, took several fresh *Colias christina* and a *Pieris occidentalis* en route, and arrived at 4.30.

While my story of the mountain is finished, I might record a few captures made during the next two days in the valley. On

the 18th I took a male of the very rare dragonfly *Somatochlora septentrionalis*, and on 19th three males of *Somatochlora hudsonica* —making nine species of the genus in nine days. This is believed to be the world's record. On the 19th, with Mr. Bowman's assistance, I also took 60 *Cœnagrion interrogatum*, of which dragonfly but eight specimens had previously been taken, a long series of *Somatochlora albicincta* and a fine *Euchlöe ausonides*.

Mr. Bowman, on the nights of 15th and 16th worked "light" for months, and he and I collected at night together 17th, 18th and 19th. Of the mass of material taken I will mention a few. Six *Neoarctia beani*. This was somewhat of a surprise as we believed the insect a mountain-top species. Of the genus Autographa, the following: 1 *mappa*, 1 *putnami*, 1 *excelsa*, 2 *flagellum*, 4 *orophila*, 13 *Euxoa mollis*, 10 *Phasiane ponderosa*, 2 *Hydriomena perfracta*, etc. At Nordegg also in May last Mr. Bowman took a fine series of *Spodolepis substriataria*.

But few varieties of birds were noted on the mountain, viz.: eagles (both the golden and bald-headed occur there); a finch, I think *Spinus pinus*, and the large grouse *Dendragapus obscurus*. In the valley on 19th July Mr. Bowman and myself had a good opportunity to observe an Arctic three-toed woodpecker, *Picoides arcticus*.

Mammals were very little in evidence on the mountain. I saw what looked like a rather large chipmunk on the loose shale where *astarte* dwells, one squirrel at the camp, and some deer tracks near the top. I also heard a mountain marmot—the whistle of which is unmistakable. Of course, bears, both grizzly and black; bighorn sheep and goats all occur near Nordegg, but Coliseum would hardly be high enough for sheep or goats, and I certainly saw no signs of bear.

Nordegg, as an entomological collecting ground, is rich and virgin soil, and systematic work there for several years should produce fine results. While the town is really a coal mining camp, any collector would be made welcome, and Mr. Stuart Kidd, of the Bighorn Trading Company, would, I am sure, arrange camping facilities to meet any collector's requirements.

## NOTES ON BARNES AND McDUNNOUGH'S "*CHECK LIST OF LEPIDOPTERA OF BOREAL AMERICA*."

BY F. H. WOLLEY DOD. (ON ACTIVE SERVICE.)

The authors of the new Check List have followed Sir George Hampson's arrangement of families and genera, making certain changes which for various reasons seemed advisable. They have discarded certain of Hampson's generic names, considering that compliance with Banks and Caudell's "Entomological Code" was more likely to meet with general acceptance than the law of strict priority, which has been most rigidly adhered to by Hampson. With that exception, the changes made in generic reference and in specific synonymy are based on careful study of structural characters and positive identification of species. For many years the authors have been making a most careful and systematic study of types, and of figures and descriptions as well. With the enormous amount of material at their disposal they have been able to compare and match types exactly, and have accurate figures made of others, and by studying long series from various parts of the continent, have been able to trace associations which Hampson, with fewer specimens available, had no opportunity of doing. Whereas in Hampson's work the arrangement of the species in each genus is in tabular form, based (1) on secondary sexual characters, and (2) on certain details of colour or maculation, in the new list the species are, to a great extent, grouped together according to their degree of apparent relationship to one another, a more scientific method from the writer's point of view, though one presenting considerable difficulty in accomplishment, owing to the diversity of relationship of many species to others in different groups. Thus the position of a species in a large genus in the new list, whilst in general denoting affinity to those placed near it, does not necessarily signify nearer relationship to them than to others placed apart from it.

The careful and painstaking methods of Messrs. Barnes and McDunnough have been well known to the writer for years, and, as regards the Noctuinæ, he has most carefully followed their published notes, and not infrequently exchanged correspondence and ideas with them, which has resulted, it is to be hoped, in mutual

benefit. The writer has made a special study of specific characters in the Noctuinæ, but must admit the undoubted advantage which the authors have over him in the amount of material examined. By far the greater number of changes in synonymy in this family made by them are much in accordance with his own views, but it is perhaps inevitable that he is unable to concur fully with their opinion on all points of relationship or identification, though in some instances he must submit to their superior knowledge. Some of the divergences of view are doubtless the result of differences of conception as to the term "race." On the whole, the authors have, perhaps, erred on the side of conservatism, and usually have been inclined to give a doubtful form or race the full benefit of the doubt in placing it as a species. It may be that the writer has grown unconsciously to err in the other direction.

Notwithstanding a complete index, collectors who have not studied Hampson's works may, at first, experience some difficulty in finding their way about the list. But too full a synonymy in a mere check-list, which is all that it purports to be, is apt to be confusing rather than otherwise. The majority of the points in which the list differs from Hampson have been referred to in various publications, but principally by the authors in their "Contributions." A few changes, however, appear for the first time.

The following notes and criticisms include those that are confirmatory, controversial, and contradictory. Some of the points referred to have previously been published by the writer in sundry papers, and no excuse is offered for repetition. Those of a contradictory nature are in no wise intended to be derogatory to the value of the list, or to the knowledge of its authors, but rather, it is hoped, to enhance its value, and offer suggestions for future investigation.

*Arctia obliterata* Stretch. stands as an aberration of *ornata* Pack. (978). If that is correct, the identification, as Stretch's species, by Dr. Dyar, of a Calgary specimen in my collection, which is almost certainly a form of *turbans*, must be wrong.

*Euxoa collocata* Sm. stands as a synonym of *atristrigata* Smith. This reference is new to me, though I had tentatively as-

sociated them from a figure of the latter which was described in 1890 from a single poor and badly-rubbed specimen from "N. W. B. C." I did not recognize it when I saw the type, which must be a very pale specimen. I had not previously heard of *collocata* from Canada.

*E. rubefactalis* Grt. is made a synonym of *infracta* Morr., which is also new. The latter is known to me only by the description, which is meagre, but does not misfit.

*E. relaxa* Sm. It is a surprise to see this referred to *septentrionalis* Walk. I knew the latter well by sight when I saw the type of *relaxa* in 1910, and pointed out several specimens of what I believed to be Smith's species to Dr. Barnes about a week later, amongst a lot of unstudied material which he handed me to look through. I never for one moment associated it with Walker's species, and am under the impression that it is still absent from my own collection. I am not willing to accept the reference at present.

*E. declarata* Walk., with *decolor* Morr. as a synonym, is kept distinct from *campestris* Grt. Walker's type is a rather large male from Vancouver Island. Grote's is a rather smaller and narrower-winged female from New York. Both are even, dull fuscous brown. It would be hard to find two specimens more alike in colour, and all the details of maculation are exactly similar also, and, as I have before stated, I consider them identical. Morrison's type I never saw. Smith stated that it was a form with contrasting light and dark shades. The original description is not very lucid, but seems to indicate something of the kind, especially as it begins, "allied to *geniculata*."

*E. tessellata* Harris. The synonyms and varieties placed under this name are, as a whole, much as I had them in my own notes, though it is not clear why five of Smith's names stand as synonyms of var. *tesselloides*. Judging from a number of figures by the authors as *orbicularis* Smith, I should include that without question. But this name stands as a species separated from the present one in the list by over sixty others,

and associated closely with *mœrens* and *sotnia*, which have little in common with *tessellata*.

*E. olivia* Morr., hitherto unrecognized in our lists under *Feltia*, the authors have apparently examined, and consider it to be prior to *lacunosa*. Morrison's species is still unknown to me, and I have several times changed my opinion about the type of *lacunosa* in the British Museum. But the other six names here referred to as synonyms or varieties, are in my opinion all one species, and the same as the *lacunosa* of the Henry Edwards collection.

*E. criddlei* Sm., is made a variety of *exculta* Sm. That is new to me. I knew them to be close allies, and do not dispute the reference, but I must refer *criddlei* to *perpolita* Morr., though I little suspected it on first acquaintance with *criddlei*, and before I saw the black form.

*E. sessile*, *termessa* and *nœvula* are treated as one, as I had suggested in correspondence that they should be, but their reference to *alko* Strk. is new to me.

*E. friabilis* Grt. stands as an aberration of *messoria*, which I believe to be correct. Dr. McDunnough and I studied the type together, and arrived at the same conclusion. It came from Ontario.

*E. vallus* Sm. I had not previously associated this closely with *hostoniensis*, but am interested to note the suggested near relationship.

*E. vulpina* Sm. I think this should certainly be nearer *quinquelinea*.

*E. nesilens* Sm., is correctly referred as a form of *tristicula*, but I have referred the former name as a synonym of *remota* Sm. Two female types of *remota* in the Henry Edwards' collection were exactly like Calgary *nesilens*, and a type in the Washington collection, while differing in certain details, agreed with a Calgary *nesilens* in Dr. Barnes' collection. The author places *remota* next *tessellata*, separated from *nesilens* by nearly forty species.

*Chorizagrotis auxiliaris, soror, agrestis* and *inconcinna* stand as four species, with *intraferens* as a form of the first named. The latter is correct, but *agrestis* and *auxiliaris* are also the same species as I have proved by breeding from a known parent. Nor am I able to recognize *soror* Smith as distinct. The species appeared in millions in Southern Alberta in the spring of 1915, the larvæ doing widespread damage to field crops. I have little faith in the distinctness of *inconcinna*, but must let that stand for the present.

*Rhizagrotis insertans* Sm. Another of those species, described in 1890 from B. C., of which I had seen the type, but failed to recognize it. The authors place it between *albalis* and *cloanthoides*.

*Agrotis acarnea* Sm. The species, besides having spined tibia, has slightly hairy eyes, which fact I pointed out to Smith in 1910, though he failed to see it. A few other specimens have since come to hand, and one is in the British Museum. Hampson has described a new genus, *Trichosilia*, to receive it. It is is related closely to *Episilia*.

*A. inopinatus, sierræ* and *unimacula* stand, in this order, as three species. The latter name is used by Hampson as prior to the long familiar *haruspica*. I have quite failed to separate *inapinatus* from *unimacula*. *Sierræ* is doubtful, but is scarcely well placed between the other two names.

*A. atricincta* Sm., is referred to *tepperi* Sm. This is quite new to me. I have not seen the type of the latter, but assume the reference to be correct.

*Aplectoides fales* Sm. I cannot consider this distinct from *pressus* Grt. as listed. It is not unlikely that more of Smith's names in this genus will have ultimately to be referred to Grote's species.

*Ufeus* Grt. I have referred *hulstii* Sm. described from Utah, to *plicatus* Grt. In the new list they stand as distinct. I have carefully compared Grote's description with the Grote specimen (not the type) in the British Museum. This leaves me

in doubt as to whether my previous identification of *plicatus* —made on unsound evidence—was correct, and for the present I provisionally accept *hulstii* as distinct. It occurs in Canada, and stands in most collections as *plicatus*.

*Anytus* Grt. The species previously referred to *Fishea* Grt., as well as to *Anytus*, are included under this generic name. *Hanhami* Smith, described from Vancouver Island, stands as a var. of *evelina* French. *Discors* Grote, identified by Smith as a *Luperina* near *burgessi*, is now referred to this genus, with *vinela* Smith as a synonym.

Next comes *cupola*, a species described by Hampson from specimens sent him by the writer from Utah. Then follow, in this order, *yosemitæ* Grt., *enthea* Grt., *instruta* Sm., (syn. *derelicta* Hamp.), *exhilarata* Sm. and *betsia* Sm. *Exhilarata* I have referred elsewhere to *yosemitæ*, and Smith( in litt.) concurred. It is not clear why they are here separated by the other names. *Derelicta*, from Aweme, seems correctly referred to *instruta* from De Claire, both Manitoba localities. This species is *yosemitæ* of previous lists, though this reference is not given. It is unquestionably very close to *enthea*, and may prove to be a pale form of it. *Betsia*, which I have from the type locality in Utah, is very likely a pale form of either *yosemitæ* or *instruta*, which are very close allies.

*Matuta* Grt. (*Adelphagrotis* Sm.) *Apposita* should not stand between *stellaris* and *quarta*, which are more nearly related to one another than *apposita* is to either.

*Rhynchagrotis* Sm. Not much revision of the list of these species has been attempted by the authors. The genus is, if possible, a more difficult one than *Euxoa*,and until many of them have been bred, it is perhaps as well to leave the names about as they stand.

*Scotogramma* Sm. *Trifolii* is referred here, as per Hampson. *Mutata*, described by me under *Mamestra* as an ally of *trifolii*, also stands under this genus. Hampson has placed it in the collection under *Cardepia* as an ally of *nova* Smith. I accept his generic reference, though superficially the resemblance is

nearer *trifolii*. *Oregonica* stands as a species, with *morana* Smith as a variety, and I believe that to be correct. *Inconcinna* Sm. stands next, and is most certainly well placed.

*Polia* Ochs. Following Hampson, this generic name is used for *Mamestra* of previous lists. Hampson, however, has found *Miselia* Ochs. to be a prior name. *Distincta* Hbn. is a difficult species to place in a list, as it seems to have no very close ally, but it surely has no justifiable position between *determinata* and *columbia*. Also the relationship suggested by seeing *leucogramma* between *columbia* and *meditata* is new to me. I believe *columbia* to be a local form of *meditata*, and have expected that *determinata* may prove to be the same species.

*P. ingravis* is very likely the same as *quadrata*, though they are here separated by twenty-two species.

*P. lubens* is referred to *cristifera* by Hampson, but now they are correctly separated. *Invalida*, which stands as distinct, I believe to be *cristifera*. The two Vancouver Island specimens of *glaucopis* Hamp., on which the description was based, looked at first rather sharply distinct from the poor series of *lubens* in the British Museum, but after seeing more material, I agree with the authors in considering it only a variety.

*P. mystica* Smith (1699) should most certainly come next to *nimbosa* (1696).

*P. dodi* (1716). The correct place for this seems between *tacoma* (1709) and *lilacina* (1717); and *liquida* (1707), of which I consider *meodana* (1708) merely a variation, belongs to the same group. I should prefer to see *atlantica* (1710) between *subjuncta* (1686) and *nevada* (1687), and indeed in Western Canada it may sometimes be confused with the latter. A Calgary male in the British Museum bearing Barnes' and McDunnough's label "*nevada*" is a dark, richly coloured *atlantica*.

*P. detracta* (1659) would closely associate with *goodelli* (1718), and *acutermina* (1719) is very doubtfully distinct from the latter.

*P. pulverulenta* Smith. If my identification of this is correct, it is unquestionably distinct from *assimilis*, though it still stands as a variety, as described by Smith, and subsequently listed by him and all other authors. Both occur in Alberta, and not only are they separable superficially, but the male genitalia differ obviously. This happens to be at variance with Prof. Smith's own statement, and it is not unreasonable to suspect some inaccuracy on his part. I must admit I have not seen the type, but my identification fits the description exactly, except as to genitalia.

*P. larissa* (1739). I cannot consider this to be distinct from *anguina* (1732). The type of the latter is in the British Museum, and a comparison with seven Calgary *larissa* there shows them, to my mind, to be identical. *Imbuna*, *vicina*, *acutipennis* and *pensilis* stands as four species. They comprise a rather puzzling aggregate which requires thorough investigating with the aid of breeding and genitalic study. There seems little to separate *imbuna* from *vicina* except size, and that difference is well within the reach of variation. *Acutipennis* seemed satisfactorily referred to *vicina* also, where Hampson left it. I still try to keep *pensilis* separate in my collection, though I have much difficulty in placing material from some localities.

*P. negussa* (1682), whilst correctly in close association with *plicatus* (1681), stands widely separated from *gussata* (1742) in the new list. In so far as it is possible to be sure without having bred them, I am convinced that the first and last named are forms of one species. Mr. Tams worked specially for them in the spring of 1915, and procured a fine series, whilst Mr. Sanson took a number at Banff in the same year. The variation is continuous between the two extremes. I refer both names to *segregata* (1741).

*P. beani* (1743). The nearest ally of this is surely *legitima* (1741).

*P. tenisca* Sm. stands as a variety of *stricta*, and, contrary to my original belief, I consider this correct.

*P. olivacea* Morr. The ten names standing as varieties of *olivacea* are scarcely all of varietal value, but one of them, *comis*, may possibly prove distinct, in which case *petita* is probably a variety of it. Breeding from Vancouver Island females may throw some light on the problem.

*P. hanhami* B. & McD., and *alfkeni* Grt. are both now referred by Hampson in the collection to *Eriopyga*, where they seem to fit better. His error in placing Grote's species with the Acronyctinæ in the catalogue has been elsewhere referred to.

*Eriopyza* Gn. I have referred *smithi* Dyar (1861) to *incincta* Morr. (1819), but am open to conviction to the contrary if good evidence is forthcoming. *Uniformis* stands as distinct from *furfurata* with very doubtful correctness.

*Nephelodes* Gn. I cannot agree to the separation of *tertialis* from *emmedonia*. The latter name Hampson has found to be prior to *minians*.

*Xylomiges* Gn. I am glad to see *indurata*, *nicalis*, *tantiva* and *argus* all referred to *curialis*, as that is fully in accord with my own views formed after seeing the types; but that the names are all of varietal value is hard to believe.

*Orthosia* Ochs. This is used by the authors instead of *Monima* Hbn. of Hampson, and includes the large species under *Graphiphora* in Dyar's list. The treatment of a very large number of Smith's names throughout the Noctuidæ,would probably have caused him deep concern had he been spared to see it, but the retention of so many as referring to varieties might have given him some solace. Under the latter category, with doubtful justice in every case, come his seven names under *hibisci*. If they can really all be retained, I feel that my *latirena* referred to too large an aggregate, and is not sufficiently definite to be retained as well.

(To be continued.)

# GEOMETRID NOTES.

## On the Genus Xanthorhöe.

BY L. W. SWETT, LEXINGTON, MASS.

*Xanthorhöe pontiaria* and *forsaria* Taylor have been so often misidentified in collections, that I have tried to straighten them out in this paper. About three years ago Mr. E. H. Blackmore, of Victoria, B. C., collected a long series of all the forms and sent them to me to work up. Through the kindness of Drs. Barnes and McDunnough I was supplied with types and paratypes of both species, so that I did not have to rely on descriptions.

*Xanthorhöe pontiaria* was described by the Rev. G. W. Taylor in the Canadian Entomologist, vol. XXXVIII, p. 400, Dec. 1906, from four specimens, the type being a female from Wellington, B.C., May 23, 1905. There were two other females agreeing with the type, and from the same locality, but the male from Salem, Oregon, June 2, 1904, on a closer examination, proved to be distinct and a good species. The typical *pontiaria* Taylor is whitish fuscous in colour and resembles slightly the European *fluctuata*, but is much larger. The central band of the primaries is usually brownish, with a whitish centre, in the type form. The anal tuft of hairs of *pontiaria* is bushy and reddish-shaded, and seems broader than in any of the other species. The head is reddish-tinged in front, and the antennæ appear to have longer pectinations than the other species. There is a form of *pontiaria* in which the central band is solid reddish brown, but this is not so common as the white-centred variation. The male type of *pontiaria*, as I have said before, is not conspecific with the female; and as the female was designated as the type, I propose to describe the male as follows:

**Xanthorhöe macdunnoughi,** sp. nov.

Antennæ rather narrowly pectinate, palpi short; front of head gray, as is thorax and abdomen. The primaries are dark ashen gray, with a broad, irregular fuscous band centrally. Basally there are several indeterminate hair-lines, rounded outwardly below the costa. Just before the intradiscal line there is pale band crossed by a geminate, brown hair-line, following the same course as the intradiscal line. The intradiscal line is geminate, bent

sharply outwardly below costa, then running in scollops on the veins to inner margin. Beyond the intradiscal line is a brown hair-line scolloped outwardly on the veins and bordering the pale, central portion of the median band. Just before the extradiscal, is another hair-line, following the same course and scolloped on the veins. The central part of the band is lighter with a small, black discal spot. The two central hair-lines have a tendency to form confluent circles in the median band of the primaries. The extradiscal line is geminate, composed of two hair-lines bent outwardly below the costa, forming a projection, then making an inward and outward curve to form a second projection. From the second projection it curves slightly backward, then runs straight to inner margin. The pale space beyond the extradiscal line is crossed through the centre by a scolloped hair-line. A submarginal brown scolloped line, the scollops running inwardly on the veins. The margin is fuscous traversed by a white, subterminal scolloped line. The fringe is short, fuscous, with small, geminate, black dots at the base. Secondaries pale gray with six or seven indeterminate, brown, wavy, hair-lines crossing them. The basal line runs just outside of the discal spot, curving upwards slightly as it leaves inner margin. The next two lines follow the same course as the extradiscal, and beyond this is a pale band, with a hair-line running through the middle. Margin of wing fuscous with a white, scolloped, subterminal line. Beneath the primaries are smoky ashen, with the lines above showing faintly through. Secondaries marked the same as above, only the lines are, in most cases, accentuated as dots on the veins.

This is a rather rare species, and not so ashen in colour as *pontiaria*, being more of a gray fuscous colour. I take pleasure in naming this species after Dr. McDunnough, who has given us many valuable papers in the "Contributions," despite several adverse criticisms which have recently appeared.

Expanse 25–30 mm.

*Holotype.*—♂, May 30, 1915, Victoria, B.C., from E.H.Blackmore, in my collection.

*Allotype.*—♀, May 14, 1913,Victoria, B.C., from E. H. Blackmore, in his collection.

*Paratypes.*—3 ♂s and 2 ♀s from Victoria and Duncans, B. C., in my collection; 4 ♂s, 7 ♀s, June 7 to July 3, from Victoria and Goldstream, B.C., in the collection of Mr. Blackmore. One ♂ Salem, Oregon, June 2, 1904, with other ♂s and ♀s from British Columbia in the Barnes' collection.

*Xanthorhöe macdunnoughi* can be easily separated from *pontiaria* Taylor by the general gray colour of the primaries, the gray head (that of the latter being reddish) and the narrower pectinated antennæ.

*Xanthorhöe forsaria* Taylor (Can. Ent., l. c., p. 401) has been a puzzle for a long time. It is evidently a species of high altitudes, as I have never seen any except from mountainous regions. The specimen from Laggan, Alberta, July 20, 1904, may not be the same as *forsaria*, as I have a ♀ from the same district which seems distinct. The type specimen taken in August is a yellowish ashen with a faint, reddish brown median band, the whole insect having a rubbed appearance. I have seen two other specimens taken on Mt. Cheam, B.C., by Mr. Bush through Mr. E. H. Blackmore, and they agree with Drs. Barnes' and McDunnough's specimens. The central band is narrow at the inner margin, and has the projections of the extradiscal line well rounded off. I have a form approaching *forsaria* Taylor very closely from Atlin, B.C., which I propose to describe as follows:

**Xanthorhöe atlinensis,** sp. nov.

Head, thorax and abdomen fuscous; antennæ rather narrow as in *macdunnoughi*. Primaries smoky fuscous, rather diaphanous, crossed by seven or eight scolloped fuscous lines, with a faint, reddish brown median band. There is a basal brown patch, the outer edge of which runs out from costa toward median vein, then bends backward and goes to inner margin. There are three brown scolloped hair-lines between basal and intradiscal lines. The intradiscal line curves slightly outward till just below costa, then runs straight to inner margin, with a slight curve, being accentuated on the veins. There is a second hair-line running exactly like the intradiscal and almost touching it. The centre of the median band is lighter than the sides, and has a small, black spot. There is a hair-line just before the extradiscal which makes

quite a sharp projection below costa, then curves back and runs straight to inner margin. The extradiscal line goes straight across costa, the forms the usual sinus, the projections of which are rather more rounded than usual. Below the second projection the extradiscal line runs back, then goes straight to the inner margin, being rather narrow there. The median band has a reddish brown, somewhat washed-out appearance, as in *forsaria*, and is narrow at the inner margin. Beyond the extradiscal line is the usual pale band, with two scolloped hair-lines; and a fuscous outer margin, with subterminal, scolloped, white line. The fringe is short and fuscous, with the small, marginal dots rather contiguous. Secondaries pale smoky fuscous with six or seven indeterminate scolloped hair-lines, accentuated as dots on the veins. The extradiscal line runs straight out from costa, making a rounded angle below the small, black, discal joint. There is a pale band which is crossed by a scolloped line, then a heavy scolloped submarginal line, followed by a fuscous marginal border with the usual subterminal, scolloped, white hair-line.

Beneath the primaries are as above with the lines faintly showing through, but the basal portion is darker than the outer portion. Secondaries as above, but are darker basally.

This species is closer to *forsaria* Taylor than any other, but differs in the smoky diaphanous colour where the former has a yellow or ochreous tinge. It also differs in the time of appearance. These species all have the lines and bands running about the same, and it is very difficult to draw any one character as constant.

Expanse 30 mm.

*Holotype.*—♂, June 26, 1914, Atlin, B.C., from Mr. E. H. Blackmore, in my collection.

*Paratypes.*—One ♂, June 28, 1914, from Mr. Blackmore, in my collection, and 6 ♂'s, June 28, 1914, in coll. Blackmore and the Provincial Museum, Victoria, B.C. There is still another species occurring in the vicinity of Victoria, B.C., which emerges early in the season and resembles superficially *pontiaria* but is more fuscous, and the central band is solid blackish with a tendency to fade below median vein, as in *forsaria* and *atlinensis*. This species was taken along with the others by Mr. Blackmore, and

as it is through his efforts that I have been able to prepare this paper I propose to describe it as follows:

**Xanthörhoe blackmorei,** sp. nov.

Antennæ broad as in *pontiaria*, front of head with reddish tinge, thorax and abdomen fuscous ashen. The primaries are fuscous ashen, a basal brown band starts at an angle from the costa, turns back and goes straight to inner margin. There is a pale space crossed by three scolloped hair-lines beyond the brown basal patch. The intradiscal line starts at an angle below costa, then curves outwardly to inner margin. In the holotype, the intradiscal line curves outward from costa to inner margin and lacks the sharp bend downward on costa which occurs in some specimens. The median band is usually solid blackish with a wine-coloured tinge, and has a tendency to disappear below median vein. In some examples the centre of the median band is pale and there are the geminate intra- and extradiscal lines, as in the other species. The extradiscal line runs downward from costa about 3 mm. and then forms a small sinus, the second projection of which is about on a line with median vein. Below the median vein the extradiscal line makes two scollops inwards, then runs straight to inner margin, scolloped on the veins. There is the usual pale, extradiscal band and scolloped hair-lines with the marginal band beyond and subterminal, white scolloped line. The fringe is short with small, black dots on either side. The secondaries are fuscous ashen, with the usual lines, except that in some specimens the extradiscal line is strongly angled below the discal dot. Beneath the primaries and secondaries are marked as above but paler, except in the basal portions, where they are smoky.

Expanse 28–30 mm.

The early date of appearance, together with tendency of the extradiscal line to be angulate, and the blackish median band of primaries, help to separate this species from the others.

*Holotype.*—♂, May 2, 1915, Victoria, B.C., from E. H. Blackmore, in coll. Swett.

*Allotype.*—♀, May 19, 1915, Victoria, B.C., from E. H. Blackmore, in coll. Swett.

*Paratypes.*—♂s and ♀s, from Victoria and Goldstream, B.C., in colls. Blackmore, Barnes and Swett.

These closely allied species are best separated by the genitalia, as the markings run very close and they are rather variable.

*Xanthorhöe pontiaria* differs from the others in the shape of the costa of the valvæ, near the tip, which is somewhat sickle shaped and has heavy, tooth-like spines resembling a lobster claw. The sacculus is long and jointed, the saccus does not taper but is broad and rounded at base. The penis is stout with a spined, bulbous head, the spines being long and heavy. The calcar is not heavily haired.

*Xanthorhöe macdunnoughi* has a very short, chunky costa, with deep sinus near the tip, which is heavily armed with fine spines, extending around tip almost to the indentation on the sacculus. The sacculus is not elongated as in *pontiaria* and has the indentation opposite projection of costa above, and is very broad and somewhat angulate near the base. Penis stout with bulbous spined head; calcar with fine, short hairs. The saccus is not blunt but rather long and tapering. The shape of the saccus alone would separate these two species.

In *Xanthorhöe blackmorei* and the two species following, the costa of the valvæ is of a very different shape. About half way between the tip and base there arises a jointed projection like the horn of a rhinoceros, with the point directed just above base of uncus. On the outer side it slopes down forming a sinus, the extreme tip of costa being club shaped and with a few fine spines. The sacculus is elongated, rounded at tip, and has very slight indentation opposite base of projection. Near the base it forms quite a sharp angle. The calcar is longer haired than the former species and rather coarse. The saccus is broad and blunt like *pontiaria* at tip.

*Xanthorhöe atlinensis* shows a close relationship to *blackmorei* in the shape of the costa of the valvæ but differs as follows: The projecting horn is a little nearer base and just before it there arises a second little horn. The horn is more erect than in *blackmorei* and on the outer side slopes down, forming a gentle elongated sinus, the tip of it being just rounded, not swollen or club shaped. The sacculus is elongated and pointed at tip, and opposite the

horn has an oblong indentation, and the base lacks angulation. The saccus is broad but has a suddenly narrowed tip; the calcar has rather long hairs, but they are rather sparse. The penis is stout and bulbous with spines, and the cornuti of the vesica are three in number, long, moderate and short.

In *Xanthorhöe forsaria* the costa of the valvæ is shaped as in *atlinensis*, but the first horn is much longer, as is also the large one. On the outer side of the large horn is a slight point or rudimentary spine. The large horn is nearer tip of costa than in *atlinensis*, also it makes a very slight sinus, and the tip is quite narrow with many fine spines. The sacculus is elongate and pointed but broader than usual, and the base is very wide and rounded. The calcar has numerous fine, short hairs, and the saccus is broad with a stubby, rounded tip, not narrow as *atlinensis*. The penis does not seem quite so bulbous or so stout as usual, though it is decorated with the usual heavy spines. Probably all the species have the three cornuti on the vesica. My mount of *Xanthorhöe forsaria* was made from a ♂ paratype, which Dr. McDunnough kindly gave me. The shape of the costa of the valvæ and the sacculus, and the type of the saccus, seem to give better characters for separation than the penis in this group, though with more material the results might prove different. The above description is based entirely upon the male genitalia, as I had too few females to spare for slides. Possibly *atlinensis* may prove a northern race of *forsaria*, but I cannot tell without more material, and the sexual characters would seem to keep them apart.

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PHENACOCCUS STACHYOS Ehr. (= *P. pettiti* Hollinger).

In the Canadian Entomologist for August, 1917, the writer described, as new, a mealy bug from Missouri. A short time after the description was published, G. F. Ferris called my attention to the apparent similarities that he thought existed between *Phenacoccus pettiti* Hollinger and a certain Californian species previously described by Ehrhorn as *P. stachyos*. A slide mount of the California species was submitted to the writer for comparison with his series of individuals of the Missouri species. Ferris states that the specimen he submitted to the writer is a topotype

of Ehrhorn's species, and so it is with this information that the writer has arrived at a definite conclusion relative to the synonymy. The main characteristic of this species, as mentioned by the writer in the August number of this journal, is the presence of projecting glands in the anal lobes as well as at various points throughout the body of the insect. Ehrhorn overlooked this prominent character in his description, and in so much as that description is lacking in certain details, the few points of similarity mentioned did not lead the writer to suspect that the Missouri species was the same as *P. stachyos* Ehr.

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## SOME HETEROPTERA FROM THE PARRY SOUND DISTRICT, ONT.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, N.Y.

In 1915 Mr. H. S. Parish collected Heteroptera in the Parry Sound District, Ont. His collection was not very extensive, owing to the time of the year he was there. It was typical of the temperate part of Eastern North America. The results are presented here as a fragment towards our knowledge of the fauna of Canada.

The species are arranged according to Van Duzee's Check List, for the sake of conformity, but it should be understood that I do not at all subscribe to that arrangement, as I deem it phylogenetically unsound, for all that it is based (with changes) on the late Prof. Reuter's last work. This, I am sure, he would have modified, had he lived, as he would have come to recognize, e. g., that the Nepidæ bear no close relationship to the Belostomatidæ. Branched antennæ, in subaquatic forms, are no indication of relationship else the aquatic bugs and beetles are akin; they only indicate convergence through function.

*Homœmus æneifrons* Say, July 10, 26; Aug. 5.
*Mormidea lugens* Fabr., June 14, 1 sp.
*Euschistus euschistoides* Voll., June 10, 14; July 1; 4 sp.
*Euschistus tristigmus* Say, June 8; 1 sp.
*Cœnus delius* Say, June 28; 1 sp.

*Neotiglossa undata* Say, June 10, 3 sp.

*Cosmopepla bimaculata* Thomas, June 14, 1 sp.

*Banasa calva* Say, June 14, 24, 2 sp.

*Perillus exaptus* Say, July 10, 1 sp.

*Podisus maculiventris* Say, June 22, 1 sp.

*Alydus conspersus* Mont., July 26, 28, 2 sp.

*Corizus crassicornis* Linn., June 18, 24; July 10, 28; 8 sp.

*Corizus bohemanni* Sign., June 24, 1 sp.

*Neides muticus* Say, Aug. 8, 2 sp.

*Nysius californicus* Stal., Aug. 28, 1 sp.

*Nysius ericæ* Schill., June 23; July 6, 10, 28; 13 sp.

*Ischnorhynchus resedæ* Panz., June 7, 9, 22, 23; 13 sp.

*Cymus angustatus* Stal., June 16, 18; 23, 24, 26; July 6, 7, 10, 23, 26; 13 sp.

*Cymus discors* How., July 23, 16 sp.

*Blissus leucopterus* Say, June 18, 1 sp.

*Geocoris bullatus* Say, June 20, July 8, 2 sp.

*Ligyrocoris diffusus* Uhl., July 26; Aug. 5, 8; 4 sp.

*Sphærobius quadristriatus* Barb.? July 23, 25, 26; 6 sp.

*Corythucha marmorata* Uhl., July 23, 26, 2 sp.

*Corythucha* sp., June 8, 20; Aug. 6; 10 sp.

*Sinea diadema* Fabr., Aug. 5, 3 sp.

*Pagasa fusca* Stein., July 27, 1 sp.

*Reduviolus subcoleoptratus* Kirby, July 10; Aug. 5; 5 sp.

*Reduviolus ferus* Linn., June 18; July 10, 26, 27, 28.

*Reduviolus kalmii* Reut., June 14, 15; July 9, 14, 18, 22; 1 sp.

*Anthocorus musculus* Say, July 26, 28, 4 sp.

*Triphleps insidiosus* Say, July 10, 28, 3 sp.

*Dicyphus fameliculus* Uhl., June 8, 23, 2 sp.

*Monalocoris filicis* Linn., June 7.

*Labops hesperius* Uhl., June 7, 14, 23, 24; July 18. Long and short-winged forms. 10 sp.

*Acanthia coriacea* Uhl., June 22, 1 sp.

*Gerris rufoscutellatus* Latr., June 11; Aug. 3; 11 sp.

*Gerris marginatus* Say, June 11, 5 sp.

*Gerris buenoi* Kish., Aug. 3, 10 sp.

*Metrobates hesperius* Uhl., Aug. 3, 5 sp.

## THE BEE-GENUS BRACHYNOMADA.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

In 1807 Jurine described a curious parasitic bee from Europe, naming it *Pasites maculatus*. A ferruginous variety (var. *brunneus* Friese) occurs in Northern Africa; a specimen before me is from Biskra, Algeria, (*F. D. Morice*). A second species, *P. minutus* Mocs., occurs in Hungary; while *P. friesei* Ckll. comes from Mt. Kilimandjaro in Africa. *P. villosus* Friese, from the Transvaal, is to be called *Margania villosa*. *Pasites* has two submarginal cells in the anterior wings, 12-jointed antennæ in both sexes, and the spine at the end of the female abdomen is entire, not bifid as in *Ammobates*. According to our knowledge of bee-structure, this cannot be a primitive form; it must be derived from an ancestor with three submarginal cells, antennæ 12-jointed in the female, 13-jointed in the male, and possibly the caudal spine of the female divided. Such a type, agreeing in all general features with *Pasites*, is found where we might least expect it, in South America, particularly in Argentina. I believe the relationship between the European and South American genera is a fact, and that we have in America a remnant of a once widely distributed type, which gave rise to the now exclusively old world *Pasites*. The supposed *Pasites* described by Cresson from Cuba is now referred to *Hypochrotœnia*. The South American genus referred to was named by Holmberg in 1886 *Brachynomada*. He had two species from the Argentina, which he called *B. argentina* and *B. chacoënsis*. In 1907 Ducke gave the name *Nomada tomentifera* to a form of *B. argentina*. Friese, in 1908, gave a synopsis of the species known to him, but unfortunately referred them to Holmberg's *Dœringiella*, which is an Epeoline genus. Friese showed that the genus extended into Brazil. The list of species, as it stands to-day, is as follows:

*B. argentina* Holmbg.
" *tomentifera* (Dke.)
*B. chacoënsis* Holmbg.
*B. franki* (Friese).
" *obscuripes* (Fr.).
*B. bigibbosa* ( (Friese).
*B. thoracica* (Friese).

In 1916 (Ann. Mag. Nat. Hist., June, p. 432) I described a new genus *Austrodioxys*, with the species *A. thomasi* from the Argentine. It has in general the characters of *Brachynomada*, but there are only two submarginal cells. Ducke intimates that two submarginal cells may occur as an abnormality in *Brachynomada;* but there is no reason for doubting that the specimen of *A. thomasi* is normal.

I have before me, from the U. S. National Museum, a small bee collected by Prof. L. Bruner at Carcarana, Argentina. Ashmead examined it and referred it to the North African genus *Schmiedeknechtia* Friese. It is, however, of the *Brachynomada* type, and since it has only two submarginal cells, it ought to go in *Austrodioxys*. Unfortunately, however, the second submarginal cells receive both recurrent nervures, whereas in *Austrodioxys* the first submarginal receives the first recurrent. In *Austrodioxys* it must be the first transverse cubital which has dropped out, but in the Bruner specimen rather the second. Under these circumstances it will probably be best to consider *Austrodioxys* a subgenus only, its type becoming *Brachynomada thomasi* (Ckll.). The Carcarana insect may be described as follows:

### Brachynomada subminiata, n. sp.

♀.—Length about 7 mm., anterior wing 5; head and thorax black, strongly punctured; the face, upper border of prothorax, and sides of thorax to a considerable extent, with silvery white hair; mandibles simple with a broad, red median band; lower margin of clypeus polished and exposed; face broad; flagellum ferruginous beneath; cheeks broad, with fine, white hair; mesothorax shining, with coarse punctures; scutellum strongly punctured, broadly truncate, subemarginate in middle; tegulæ rufotestaceous; wings dusky hyaline, nervures and the large stigma dark ferruginous; first s.m. not twice as long as second; second s.m. receiving first r.n. near base, the second a short distance beyond middle; legs rather obscure ferruginous, with white hair, the anterior femora blackened; claws as in *B. thomasi;* abdomen broadly, densely punctured; first segment red; second black, red apically; third red, more or less stained with black basally; 4 to 6 dark; segments 1 to 4 with clear-cut, narrow white hair-bands,

fifth with a more diffuse band; apex with a pair of entirely separate parallel red spines, curved downward; venter red, black apically. (*Bruner*, 17).

The basal nervure meets the transversomedian; the marginal cell is obliquely truncate and appendiculate, exactly as in *Pasites*. The hind legs are much more slender than in *Pasites maculatus*, and the outer apical angle of hind tibia is much more salient. The face, though broad, is not so broad as in the *Pasites*.

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## LECTOTYPES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D.C.

(Continued from vol. XLIX, page 433.)

**Limneria compacta.** Type.—Female, Ent. Branch, Dept. Agr., Ottawa.

**Limneria crassicornis.** Type.—Male, yellow label 1222. 2nd Coll. Pub. Mus., Quebec. Left antenna beyond middle, right anterior leg at trochanter, left median tarsus and hind tarsi broken off.

**Limneria dentata.** Type.—Female, yellow label 451. 2nd Coll. Pub. Mus., Quebec. Right antenna gone at scape.

**Limneria distincta.** Type.—Female, yellow label 1060. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape, left at 6th joint, gone.

**Limneria excavata.** Type.—Not in Pub. Mus., Quebec, unless under *Limneria valida* Cress.

**Limneria flavipes.** Type.—Male, yellow label 358. 1st Coll. Pub. Mus., Quebec. Right antenna beyond middle, right wings, left hind wing, gone.

**Limneria fusiformis.** Type.—Female, yellow label 302. 2nd Coll. Pub. Mus., Quebec. Left antenna at scape, right at apex, gone; median tarsi broken; right hind tarsus and left hind leg at femora, gone.

**Limneria guignardi.** Type.—Harrington Coll.

**Limneria hyalina.** Type.—Female, yellow label 299. 2nd Coll. Pub. Mus., Quebec.

**Limneria infumata.** Type.—Female, yellow label 300. 2nd Coll. Pub. Mus., Quebec. Antennæ and one middle leg broken.

**Limneria marginata.** Type.—Female, yellow label 703. 2nd Coll. Pub. Mus., Quebec. Antennæ broken, the left before the right beyond the middle.

**Limneria nigricoxa.** Type.—Female, yellow label 675. 2nd Coll. Pub. Mus., Quebec.

**Limneria pallipes.** Type.—Female, yellow label 304. 2nd Coll. Pub. Mus., Quebec. Antennæ broken beyond middle, left hind leg beyond coxa missing.

**Limneria parva.** Type.—Female, yellow label 298. 2nd Coll. Pub. Mus., Quebec. One antenna broken at apex; hind legs gone.

**Limneria pilosula.** Allotype.—Yellow label 1100. 2nd Coll. Pub. Mus., Quebec. Abdomen glued on label, apex of right antenna gone. Type.—Female not located.

**Limneria plena.** Type.—Female, yellow label 296. 2nd Coll. Pub. Mus., Quebec. Antennæ and right hind tarsus gone.

**Limneria ruficornis.** Type.—Not in Pub. Mus., Quebec, unless under *Limneria dentata* Prov.

**Limneria ruficoxa.** Type.—Female, yellow label 303. 2nd Coll. Pub. Mus., Quebec. Antennæ beyond middle, left hind leg at trochanter, right hind tarsus and ovipositor sheaths, gone.

**Limneria rufipes.** Type.—Female, yellow label 521 and name label *Limneria mellipes* Prov. Proved by Provancher catalogue. 2nd Coll. Pub. Mus., Quebec. Antennæ broken near middle.

**Limneria sericea.** Type.—Not located.

**Limneria sessilis.** Type.—Female, yellow label 348. 2nd Coll. Pub. Mus., Quebec. Antennæ broken before middle.

**Linoceras cloutieri.** Type.—Female, yellow label 264. 2nd Coll. Pub. Mus., Quebec. Allotype.—Male, yellow label 303. 1st Coll. Pub. Mus., Quebec.

**Liris magnifica.** Type.—Male, yellow label 1721. 2nd Coll. Pub. Mus., Quebec.

**Liris rugosa.** Type.—Male, yellow label 1222. 2nd Coll. Pub. Mus., Quebec.

**Lonchidia hirta.** Type.—Not located.

**Lyda burquei.** Type.—Female, yellow label 126. 1st Coll. Pub. Mus., Quebec. Lacks left flagellum .

**Lyda harringtoni.** Type.—Female, Harrington Coll.

**Lyda quebecensis.** Type.—Female, yellow label 504. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ; only one anterior wing left, and that on pin.

**Lyroda subita.** Type.—Not located.

**Macrocentrus aciculatus.** Type.—Female, yellow label 1484. 2nd Coll. Pub. Mus., Quebec.

**Macrocentrus longicornis.** Type.—Male, yellow label 911. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna.

**Macrocentrus mellipes.** Type.—Female, yellow label 571. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ; abdomen loose and dirty.

**Macrocentrus pacificus.** Type.—Ent. Branch, Dept. Agr., Ottawa. Head gone.

**Macrocentrus pectoralis.** Type.—Male, yellow label 728. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen and some legs; antennæ incomplete.

**Macrophya albipes.** Type.—Female, white label 157; yellow label 1676. 2nd Coll. Pub. Mus., Quebec.

**Macrophya contaminata.** Type.—Yellow label 36. 2nd Coll. Pub. Mus., Quebec. Also 2 specimens without labels.

**Macrophya crassicornis.** Type.—Yellow label 1547. 2nd Coll. Pub. Mus., Quebec.

**Megaspilus lucens.** Type.—Not in Pub. Mus., Quebec, unless under *Proctotrupes flavipes* Prov.

**Megastylus politus.** Type.—Not in Pub. Mus., Quebec, unless under *Stilpnus americanus* Cress.

**Meniscus ashmeadii.** Type.—Not located.

**Meniscus crevieri.** Type.—Not in Pub. Mus., Quebec, unless under *Meniscus scutellaris* Cress.

**Meniscus marginatus.** Type.—Female, yellow label 1037. 2nd Coll. Pub. Mus., Quebec.

**Meniscus superbus.** Type.—Female, yellow label 418. 2nd Coll. Pub. Mus., Quebec.

**Mesochorus areolatus.** Type.—Female, yellow label 680.

2nd Coll. Pub. Mus., Quebec. Left antenna gone at scape; abdomen glued on yellow label.

**Mesochorus flaviceps.** Type.—Female, yellow label 358. 2nd Coll. Pub. Mus., Quebec.

**Mesochorus humeralis.** Type.—Female, yellow label 698. 2nd Coll. Pub. Mus., Quebec.

**Mesochorus jucundus.** Type.—Female, yellow label 679. 2nd Coll. Pub. Mus., Quebec.

**Mesochorus pleuralis.** Type.—Female, yellow label 367. 1st Coll. Pub. Mus., Quebec.

**Mesochorus politus.** Type.—Female, yellow label 681. 2nd Coll. Pub. Mus., Quebec.

**Mesochorus rufulus.** Type.—Female, yellow label 577. 2nd Coll. Pub. Mus., Quebec. Antennæ broken near base; hind legs except left coxa, and abdomen, missing.

**Mesochorus saint-cyri.** Not in Pub. Mus., Qubeec, unless under *Echthrus abdominalis*.

**Mesochorus truncatus.** Type.—Female, white label 464, yellow label 1559. 2nd Coll. Pub. Mus., Quebec. On a short pin.

**Mesoleius annulatus.** Type.—Female, blue label 259(s); yellow label 1242. 2nd Coll. Pub. Mus., Quebec.

**Mesoleius antennatus.** Type.—Female, yellow label 338. 2nd Coll. Pub. Mus., Quebec.

**Mesoleius canadensis.** Type.—Female, yellow label 336. 2nd Coll. Pub. Mus., Quebec.

**Mesoleius chicoutimiensis.** Type.—Female, yellow label 1584. 2nd Coll. Pub. Mus., Quebec. Most of antennæ and legs gone; right hind leg present.

**Mesoleius fissus.** Type.—Male, yellow label 339. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

**Mesoleius inflatifrons.** Type.—Female, blue label 445. 2nd Coll. Pub. Mus., Quebec.

**Mesoleius junctus.** Type.—Male, yellow label 936. 2nd Coll. Pub. Mus., Quebec.

**Mesoleius mellipes.** Type.—Male, yellow label 413. 1st Coll. Pub. Mus., Quebec.

**Mesoleius niger.** Type.—Female, yellow label 933. 2nd Coll. Pub. Mus., Quebec.

**Mesoleius tardus.** Type.—Female, yellow label 337. 2nd Coll. Pub. Mus., Quebec. Abdomen glued on.

**Mesoleius telarius.** Type.—Female, yellow label 1241, old rose label 74. 2nd Coll. Pub. Mus., Quebec. Right flagellum gone.

**Mesoleptus albopleuralis.** Type.—Male, yellow label 462. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus angustus.** Type.—Male, Harrington Coll., Labelled "Type. Rohw. Gahan."

**Mesoleptus annulatipes.** Type.—Male, yellow label 1239, name label "*Mesoleptus cinctipes* Prov." Proved by Provancher's catalogue. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus annulatus.** Type.—Female, Harrington Coll. Pink label "p. 471" Paratype, yellow label 683. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus barbatus.** Type.—Male, yellow label 1230. 2nd Coll. Pub. Mus., Quebec. Provancher mistook sex.

**Mesoleptus canaliculatus.** Type.—Male, yellow label 322. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus depressus.** Type.—Male, yellow label 400. 2nd Coll. Pub. Mus., Quebec. Lacks hind tarsi.

**Mesoleptus erectus.** Type.—Female, yellow label 399. 1st Coll. Pub. Mus., Quebec.

**Mesoleptus fasciatus.** Type.—Not located.

**Mesoleptus filiformis.** Type.—Male, yellow label 1240. 2nd Coll. Pub. Mus., Quebec. Provancher mistook sex.

**Mesoleptus flavicornis** Type.—Female, yellow label 464, 2nd Coll. Pub. Mus., Quebec. Lacks flagellum beyond first.

**Mesoleptus incompletus.** Type.—Not in Pub. Mus., Quebec, unless under *Cremastus fusiformis* Prov.

**Mesoleptus interruptus.** Type.—Female, yellow label 390. 1st Coll. Pub. Mus., Quebec. Part of antennæ gone.

**Mesoleptus lætus.** Type.—Yellow label 319. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen gone.

**Mesoleptus largus.** Type.—Female, yellow label 1231. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus laurentianus.** Type.—Male, yellow label 394. 1st Coll. Pub. Mus., Quebec. Most of left flagellum, left hind leg, apical joints of right hind tarsi gone.

**Mesoleptus longipes.** Type.—Not in Pub. Mus., Quebec, unless under *M. moveni* Prov.

**Mesoleptus lucens.** Type. Male, yellow label 318. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus maculatus.** Type. Not in Pub. Mus., Quebec, unless under *Exyston clavatus* Prov.

**Mesoleptus moyeni.** Type.—Female, yellow label 315. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus nigricornis.** Type.—Female, Harrington Coll.

**Mesoleptus perditus.** Type.—Male, blue label 165(s); yellow label 1257. 2nd Coll. Pub. Mus., Quebec. Lacks apex of left antenna.

**Mesoleptus rhopalocerus.** Type.—Male, yellow label 1561. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus rufipes.** Type.—Female, yellow label 406. 1st Coll. Pub. Mus., Quebec.

**Mesoleptus rufomixtus.** Allotype.—Male, Harrington Coll. Type.—Female not located.

**Mesoleptus rufulus.** Type.—Female, yellow label 455. 2nd Coll. Pub. Mus., Quebec. Lacks apices of tarsi except one; abdomen glued on yellow label.

**Mesoleptus sancti-hyacinthi.** Type.—Not in Pub. Mus., Quebec, unless under *Mesoleptus inceptus* Cress.

**Mesoleptus seminiger.** Type.—Female, yellow label 467. 2nd Coll. Pub. Mus., Quebec. Lacks flagella. Allotype.—Male, yellow label 401. 1st Coll. Pub. Mus., Quebec.

**Mesoleptus sericeus.** Type.—Female, yellow label 483. 2nd Coll. Pub. Mus., Quebec. Apices of flagella wanting; abdomen loose.

**Mesoleptus uniformis.** Type.—Female, yellow label 402. 1st Coll. Pub. Mus., Quebec. Cocoon on pin. Labeled *Campoplex unicolor.* Proved by Provancher's Catalogue, Provancher mistook sex.

(To be continued.)

## OBITUARY.

### SAMUEL T. WOOD.

We regret to record the death of Mr. Samuel T. Wood, of the Editorial Staff of the Toronto "Globe," which took place, after a lingering illness, on Nov. 6, 1917, at his residence in Toronto.

By his death Canada has lost a writer of great charm, and this loss will be felt by a wide circle of readers, particularly among nature lovers, for it was by his writings on natural history that Mr. Wood was best known.

Mr. Wood, who was of Scotch-Irish parentage, was born on a backwood farm in Hastings County, Ont., in 1860, and was educated at the Belleville public and high schools and the Belleville Business College. Having been from his youth an earnest advocate of single tax he was naturally attracted to journalism as a vocation, and after a year on an Ottawa newspaper he entered the service of the Toronto Globe, first as a reporter and later as an editorial writer.

For some twenty years past he contributed a series of Saturday editorials on various phases of natural history, and these articles reveal an accuracy of observation, together with a deep sense of the poetical in nature, which never degenerated into sentimentality. A selection of these articles was recently published under the title "Ramblings of a Canadian Naturalist," and met with a ready sale among the thousands of readers, who were already familiar with his work in "The Globe."

Although more particularly interested in birds, Mr. Wood possessed a love of nature too broad to restrict him to any one branch of natural history, and though he would have been the last person to claim for himself the title of "entomologist," his observations frequently led him to discourse on insects and their ways in his usual delightful manner. He was a member of the Toronto Branch of the Entomological Society of Ontario, and although not an active contributor to its proceedings his presence at the meetings was always welcome, for he was a most intelligent listener, and usually had some pertinent question or observation to make on the subject in hand.

Besides his interest in Natural History he was a keen student of economics, and published many articles on economic subjects, among which may be mentioned a series of short "Lessons in Economics," which for a time were a daily feature in the Globe; and a very excellent "Primer in Political Economy," which he published in 1901.

Mr. Wood had a very quiet and unassuming manner, and a most kindly and attractive personality, which won him a great many friends and admirers. He is survived by his father (Mr. Samuel Wood), his second wife and two sons, to whom we extend our deepest sympathy.

## ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The fifty-fourth annual meeting of the Entomological Society of Ontario was held at Macdonald College on November 8th and 9th. Among the visitors from a distance were Dr. T. J. Headlee, New Brunswick, N.J.; Dr. W. C. O'Kane, Durham, N.H.; J. H. Emerton, Boston; A. F. Burgess, Melrose Highlands, Mass.; Professor Brittain, Truro, N.S. The more prominent Quebec delegates included Dr. Chapais, St. Denis-en-bas; Father Leopold and Professor Letourneau, La Trappe; G. Maheux, Provincial Entomologist, Quebec; Dr. Corcoran and Professor Higgins, of Loyola College, Montreal; Dr. Willey, McGill University, and Messrs. Winn, Moore and Cummings, Montreal. The Ontario delegates were Dr. Hewitt, Messrs. Gibson, Swaine and Petch, Ottawa; Professor Caesar and Mr. A. W. Baker, Ontario Agricultural College, Guelph; Mr. W. A. Ross, Vineland Station; Mr. F. J. A. Morris, Peterborough; Mr. J. D. Evans, Trenton.

Following is the programme:—

Reports of Council, Treasurer, Librarian, Curator, Branch Societies, Delegate to the Royal Society of Canada, and Directors of Divisions.

"Further Notes on the Imported Onion Maggot," by Mr. Arthur Gibson; "The Entomological Service of Quebec," by Mr. George Maheux; "Some Important Insect Pests of the Season," by Prof. L. Caesar; "Insects of the Season in Quebec," by E. M.

DuPorte; "The European Hemerophila Pariana," by Dr. E. P. Felt; "Black Flies in the Dixville Notch," by Dr. W. C. O'Kane; "Some Notodontian Larvæ," by Dr. J. A. Corcoran; Address of Welcome, by Principal Harrison, Macdonald College; President's Address, by Mr. A. F. Winn, Montreal; "The Problem of Mosquito Control," by Dr. T. J. Headlee; "The Black Cherry Aphis," by Mr. W. A. Ross; "A Comedy of Errors," by Mr. F. J. A. Morris; "Trans-Canadian Spiders," by Mr. J. H. Emerton; "A Further Report on the Value of Dusting vs. Liquid Spraying," by Prof. L. Caesar; "A Few Notes on the Ecology of Insects," by Prof. W. Lochhead, Macdonald College; "The Nervous System of Caterpillars and Its Relation to Classification," by Mr. J. M. Swaine; Motion Picture Film, "Field and Parasite Work Against the Gipsy and Brown Tail Moths," by courtesy of U. S. Bureau of Entomology, Washington, through Dr. A. F. Burgess and Dr. C. Gordon Hewitt; Motion Picture Film, "Orchard Spraying in Nova Scotia," by Professor W. H. Brittain; "The Effect of Stable and Horn Fly Attacks on Milk Production," by Mr. A. W. Baker; "Habits, Behaviours and Tropisms of Insects," by Dr. Arthur Willey.

At the close of the evening session a most valuable symposium took place on the question of how Canadian entomologists can help to increase food production, introduced by Dr. C. Gordon Hewitt, in which many of the members joined.

The following officers were elected for the ensuing year:—

*President*, Professor L. Caesar, Ontario Agricultural College, Guelph.

*Vice-President*, Mr. Arthur Gibson, Ottawa.

*Secretary-Treasurer*, Mr. A. W. Baker, O.A.C., Guelph.

*Curator*, Mr. Eric Hearle, O. A. C., Guelph.

*Librarian*, Rev. Prof. C. J. S. Bethune, O.A.C., Guelph.

*Directors:* J. M. Swaine, Ottawa; C. E. Grant, Orillia; Dr. A. Cosens, Toronto; F. J. A. Morris, Peterborough; J. W. Noble, Essex, Ont.; W. A. Ross, Vineland Station, Ont.

*Delegate to the Royal Society of Canada*, The President.

W. L.

Mailed January 16th, 1918.

# The Canadian Entomologist.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### THE HEART OF A WOOD-PILE.

BY FRANCIS J. A. MORRIS, PETERBOROUGH, ONT.

The pity of it is that when you make a new find and are inwardly executing a war-dance, leaping and whooping with triumph, so often Nature conspires to produce on all sides of you the very rarity you are pirouetting over, till your prize is cheap to nastiness. I remember so well the first few spikes of the Adder's Tongue Fern that I found; what miles and miles, what months and months of search with never a sign; but as soon as the secret postern-gate had been surprised, Nature seemed in a pet to withdraw every guard and unmask her positions, so that Adder's Tongue fairly bristled about my path from that day on. The same thing happened with the famous Moonwort from the hour that I found one solitary plant on the top of the Grampians near Killin. And I could cap these experiences with a score of others, *faunal* as well as *floral*.

Last year (1916) on June 29th, I discovered on a leaf of wild grape-vine a tiny, light-grey longicorn covered with round black spots. I had never seen it before, though I recognized its kinship with the few other *Lamiinids* I had surprised at rare intervals. For an hour or more I hunted vainly over grape-foliage, and at last to my delight captured a second specimen. I was in Trenton, Ont. a few days later, and spent most of my time searching over vine leaves; a third specimen thus captured threw me into ecstasies, and when finally a fourth suddenly settled on my thumb-knuckle as I approached a grape-vine, I was in the seventh heaven. The next two days from dawn to dusk were passed in feverish search over hundreds of vines, but all to no purpose.

However, an old dog, you may have observed, will be checked or thrown off the scent a hundred times for once that it's absolutely baffled. On July 6th, having returned to Peterborough, I

determined to give the grape-vines one more scouring, before I gave up my quest as a bad job. I had three rich collecting-grounds that season, of recent windfalls that I was keeping close tab on; but one day, I thought, of the glorious July heat might go in a last effort at these *Lamiinids* even if it did prove a wild-goose chase.

Recalling that I had seen some luxuriant thickets of vine west of Jackson's Park, I made my way out to the place and spent over two hours working slowly round the sides of a clover field whose fences were festooned with the wild grape. For about 10 days within the last week of June and the first week of July, grape-vine is one of the glories of the wayside; its leaves among the most beautiful in all Nature, the tender, slightly bronzed growing shoots, the delicate tendrils, and the flood of perfume wafted from its racemes, fairly capture the senses as nothing else can. All this I revelled in, but of Longhorns, big or little, not a trace could I see.

It was after 4 o'clock when I slung myself over the fence for a short cut down the river valley in the direction of home. By the fence, near where a heap of old rails and some brush had lain, I saw two newly stacked piles of fresh-cut billets of wood. They were short cylinders of cordwood with the bark still on, ranging in diameter from 3 or 4 inches to 7 or 8. My way from the fence led between the two stacks, and as I rounded the corner of the pile on my left, I spied on the top layer one of these little grey *Lamiinids* moving rapidly along the surface of one of the billets. "Moving" sounds tame, but I use the word advisedly: the insect's progress had the speed of running, but the manner of crawling; the creature is flat, not convex, and lies almost as close on the surface it is moving over as those peculiar, flat, crab-like scorpions or wood-spiders found on stumps and under bark.

It was a piece of birch that the insect was crawling on, and casting a hasty glance around, I noticed that the wood-pile on my right was almost entirely birch, while that on my left—except for a sprinkling of birch at the corner—was poplar. However, when I came to look over the birch pile more closely, I could find nothing on it; so I turned once more to the rival stack, and almost im-

mediately spied another specimen, this time on a poplar billet; then I found 2 more, and by the time I had made the round of the pile I had captured 10; before I returned home I had taken 29 specimens, all from the top layer of billets.

Generally the insects kept perfectly still and submitted to capture rather than allow themselves to be disturbed, simply crouching as flat as they could lie in the form where they were resting. If, however, they decided, like a startled hare, to make a sudden dash for it, they very rarely released their hold at the edge of a billet. Occasionally one's attempt to pinch them up from the billet between finger and thumb was a failure; and usually if you thought to drop them into the killing-bottle by simply opening finger and thumb, they declined to humour you, but would run rapidly up your finger in a spiral and elude pursuit. I found it best, whether using a pair of forceps or just the naked hand, to jar them quite sharply in the instant of opening the jaws that held them, so that they fell into the bottle. The insect proved to be *Hyperplatys aspersa* and apparently was emerging from the bark of the poplar; I thought at first the wood was the American aspen, but later I found the stumps from which it had been cut and they were all balsam poplar or balm-of-Gilead. I have since found the beetle very abundant on newly cut poplar of this species, and occasionally on living trees; it is also fairly abundant on staghorn sumach. No doubt the few specimens I had found on grape-vine were really waifs and strays from one of these two trees.

This being the first time I had ever seen *Hyperplatys* at home (so to say), I determined to take all I could get in case the find should prove a lucky haul unlikely to recur. On the 9th and 11th, I secured 22 and 33 specimens respectively; and it was on this latter date that I tried turning over every billet in the 2nd and 3rd layers as well as the top. Had the result been merely to increase the total of captures, the experiment would not have been worth repeating. But on taking a billet from the 3rd layer, I discovered nestling snugly up against one of the blackened furrows in the area of a branch-axil, a dusky grey insect that at first I took for a crouching spider. So well had it chosen its station, that but for a certain symmetry about the little patch of grey and

black that it made there, I should never have detected it; as it was, my eye was arrested by a sense of design, and, focusing on the patch, at once unmasked the live insect; a moment more, and the longicorn was betrayed by its antennæ; these were thrown back over the creature's body and lowered almost to the space between its elytra and the up-gathered legs, in an attitude I soon came to know as entirely characteristic.

The insect was about the size of *Graphisurus fasciatus* or *Hoplosia nubila*, robust and somewhat convex, but tapering towards the tip (being both narrowed at the sides and declivous above); it reminded me considerably of *Leptostylus sex-guttatus*, but was larger and quite strongly armed at the sides of the thorax; when tested by LeConte and Horn, but for one important point, it seemed to be undoubtedly *Liopus;* and in that genus it could only be *variegatus*, for all the other species were too small. None of the authorities described my form of the insect in detail, though reference was made to a variety *obscurus* which seemed to correspond; I had some specimens in my cabinet from New Jersey and New York labeled *L. variegatus*, and they were all yellowish-brown mottled, while mine was grey-black mottled; but what troubled me most was the point in LeConte and Horn: *Liopus* should have no trace of ciliate hairs beneath the antennæ, and this beetle —especially on the 3rd joint— showed a fringe of from 3 to 6 hairs. On examining my specimens from New Jersey I found them without trace of ciliæ, but on the New York specimens I found one or two such hairs. I have captured nearly a dozen since then, and all show traces of ciliæ, some quite as strongly as *Hyperplatys*, nor can I place my insect in any other genus. I, therefore, infer that the rule-of-thumb distinction between ciliate and non-ciliate genera does not apply to the *fauna* of our northerly latitudes*.

I was so much encouraged by this find that I determined in future to turn over every billet in the 3 rows that made the woodpile. I went there the very next morning, July 12th, and proceeded to do my chore. From the top to the bottom was fully 8 layers deep and it took just about 2½ hours to turn over every

*I find this inference corroborated by specimens of *Liopus cinereus* and *L. alpha* captured near Peterborough, F. M.

billet; I suppose I had never handled so much cordwood in my life before, but it was well worth the trouble, and I was still crying for more as greedily as Oliver Twist, when I laid down the last billet after running my eye over all the bark of its surface. My catch included 46 specimens of *Hyperplatys*, 2 of *Liopus variegatus*, and 3 of a grey-looking *Liopus* said to be a variety of *alpha* known as *cinereus;* I have since learned to associate this ashy-grey form with the poplar, and the yellow-grey form of *L. alpha* with staghorn sumach. Besides these I captured a light-grey longicorn as large as *Graphisurus*, but with very strongly clavate antennal scapes, and having (besides the lateral spines of the thorax) 4 tubercles, a pair on the thoracic disc and a pair on the elytral base. It is unquestionably *Acanthoderes*, probably *decipiens* but I am not sure; this was indeed a rich haul.

On July 10th I turned over my billets of cordwood once more, and besides seeing a great many specimens of *Hyperplatys*, captured 2 more specimens of *L. variegatus* and a single specimen of *Pogonochærus*. In making an examination of this last, I could not find it to differ in any respect from the insect I had occasionally taken on white pine; but I am told that an American authority has distinguished a form he calls *P. salicola* (*sic.*) from the normal *P. mixtus*. I suppose one may be over-sensitive about mere language, but the desire to clip words down by a syllable or two often combines very disastrously with our modern neglect of the Classics. This variety of *Pogonochærus mixtus* feeds on willow and should, of course, (as any of Macaulay's schoolboys would gladly tell you) be *salicicola;* the telescoping of the middle pair of syllables unfortunately condemns the insect to durance vile in a salt-mine! There is an even more terrible example of what grammarians call "solecism" in the science of botany; I recall the delicious piece of irony that even gentle Asa Gray was goaded into over this barbarism: it appears that the man who discovered a kind of holly with blossoms set on long, thread-like stalks, wishing to name and describe his find in a single breath, christened it "*Nemopanthe*" under the fond delusion that this would mean "thread-stalk blossom;" he should, however, have called it "*Nemato-pod-anthe*," and the portmanteau word that he perpetrated was too much even for the sweet-tempered father of American botany. The vein of irony is

so rare in a technical book of science that it has a surprisingly refreshing, even exhilarating effect, like the sarcastic definitions Dr. Johnson inserted in the original edition of his great dictionary.

On the 17th, I took two more *L. variegatus;* one *Pogonochærus mixtus;* a beautifully coloured *Chariessa pilosa;* a little clerid of peculiar form, the elytra being narrower at the base and slightly dilated towards the tip; and three specimens of the pretty little *Endomychus biguttatus;* besides several species of *Curculio* and *Staphylinid.* I was under stern surveillance to pack for our annual trip to the Algonquin Park next day, but by secret calculations of a most intricate sort I proved to my own satisfaction that there was plenty of time to visit the wood-pile as well as to pack; besides, as I philosophised, the weather was far too hot for packing, and simply ideal for handling a cord or two of wood. Accordingly about 4 a.m., all unknown to Xanthippe, Socrates and the sun rose in concert over the brow of the hill and were soon absorbed in contemplation of the wood-pile.

I was somewhat embarrassed once or twice by the operations of a farmer going round and round the adjoining clover field on one of those primitive scythe-bearing machines called mowers that have presumably descended from the ancestral British war-chariots. He did not say anything, but his manner was distinctly unpleasant and spoke volumes of mingled suspicion, curiosity and contempt. To my relief, however, he appeared to decide that I was harmless and he need not interfere. This last day's experience proved both rich and varied. I took 5 specimens of *L. variegatus;* 1 *Parandra brunnea;* 1 *Saperda calcarata* (dead); 1 *Lepturges;* 1 *Leptostylus sex-guttatus;* and 1 *Acanthoderes.* In addition I saw many *Hyperplatys,* and received striking proof of "Nature red in tooth and claw," even in this peaceful, sunlit dwelling in Arcady.

My suspicions had often been roused by the number of large, black assassin-bugs in the dark recesses of the wood-pile; but the whole aspect of the place as one approached it—like Macbeth's castle to the gentle fancy of King Duncan—was peaceful and sunny; if there were no martlets flitting about it, there were butterflies galore that sailed and settled. And all the time it was the abode of murder: on the daggers of those assassin-bugs were gouts of blood. I captured one of these black marauders with a fair

specimen of *Hyperplatys* impaled on its proboscis; it had thrust the deadly stiletto through the suture of the elytra, and found the soft, defenceless body between the joints of the harness.

Nor was this all. In "The Toilers of the Sea," Hugo's famous romance of the Channel Islands, you will remember how the hero Gilliat entered the sunny sea-cavern only to find himself caught in the toils of the giant cuttle-fish. In the hollow of this wood-cave, too, lurked a monstrous Octopus. As I neared the end of the pile, I saw a huge, grey and black spider, with great hairy legs and massive obcuneate forepart (the thick end of the wedge being forward and a pair of glittering little eyes projecting out of the black mass) plunge out of sight between two piles of billets, and I fancied, in the flash of its dive, that it had a big blue-bottle in its jaws. I got my forceps ready and kept careful watch as I turned over the billets; and presently I drove him from cover and seized one shaggy thigh in the relentless grip of my steel vice. Cheek by jowl in my cabinet, staring stark and stiff, are set the killer and his prey, *Phidippus audax* and a last specimen of *Liopus variegatus*, for that was what the blue-bottle proved to be. The spider had not attempted to wedge his huge jaws in at the suture of the wing-covers, but had dug them in on the under side between chest and body, and sucked his victim so viciously that the ligaments between thorax and abdomen were wrenched apart and the elytra disjointed and loose.

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## NOTES ON BARNES' AND McDUNNOUGH'S "*CHECK LIST OF LEPIDOPTERA OF BOREAL AMERICA*."

BY F. H. WOLLEY DOD (ON ACTIVE SERVICE).

(Continued from page 16.)

*Cirphis* Walk., *Roseola* (1937) is probably a variety of *farcta* (1938), and *calgariana* (1945) of *anteroclara* (1942). *Anteroclara* and *farcta* are too nearly allied to be separated, as here, by *imperfecta* and *insueta*. *Heterodoxa*, *dia* and *megadia* stand as varieties of *insueta*, and this is very likely correct, except that the first two named are questionably distinguishable forms. The type of *dia* in the British Museum differs in negligible detail from some Calgary *heterodoxa* in the same collection.

February, 1918

*Borolia* Moore. *Amygdalina* is correctly separated from *linita* to which Hampson refers it. The former occurs at Winnipeg, and specimens are in the Museum from Maine (type) and New Jersey. *Linita* is a longer and narrower winged species with more concave outer margins, occurring in Florida. Hampson's figure under *linita* is of type *scirpicola*, which is now correctly referred to *Cirphis* with *calpota* Sm. as a synonym. It is a close ally of *phragmatidicola*.

*Heliucania* Sm. The reference to *albilinea* of *obscurior*, *neptis* and *limitata*, three of Smith's names, is in accord with my diagnosis, though I can scarcely consider *obscurior* as a variety. I am inclined to agree with Hampson in adding *tetera* Wm., which the authors keep distinct.

*Leucania* Ochs. As in Hampson's catalogue, *minorata* stands as distinct from *luteopallens*. I can see nothing to warrant the separation. *Rubripallens* is probably only a red variety of the species, though I have nothing compared with the type. *Pertracta* Morr. is included in the genus. When I saw the type of this it impressed me as probably of foreign origin, but as it apparently has not been so far identified as any other known species, it is correct that the name should be retained in our lists. Unless memory fails me, the species would be better referred to *Cirphis*. *Yukonensis* Hamps. (Ann. and Mag. Nat. Hist., VIII, p. 425, 1911) has been inadvertently omitted. *Suavis* B. & McD., judging from a co-type in the British Museum, is quite unlike any of the others now referred to this genus, and does not seem to belong here at all.

*Capucullia* Sm. I told Smith that, after examining the types, I believed *bistriga* and *mala* to be, as the authors have described, identical with *eulepis*, but he would not accept that view.

*Orthocnemis* Led. *Poliochroa* Hampson stands as a synonym of *chandleri* Grt. (2069), whilst *chandleri* Hampson is referred to *colorado* Smith (2070). The latter reference is almost certainly correct, and I had long suspected it. The reference of *poliochroa* to *chandleri* is based on the claim that Grote's original figure is the strongly marked form with contrasting

border to secondaries described as new by Hampson, and that, therefore, the supposed type of *chandleri* in the British Museum can only be the variety mentioned by Grote in his description. I cannot agree as to Grote's figure. There are two Colorado (Mead), specimens in the Museum, very much alike, one of them bearing Grote's type label. Grote's figure might very well be of the other, though the secondaries are represented too dark, it is true, but they are not dark enough for *poliochroa*. I am not satisfied that the *chandleri* of Hampson is not Grote's species.

*O. riparia* Morr. (2046) described, by the way, as a variety of *chandleri*, seems to be too close an ally of *colorado* to stand so far apart from it. *Cibalis* (2048) belongs in the same group.

*O. atrifasciata* Morr. *Piffardi* Walk. is entered amongst the additions as a prior name to Morrison's. The description of *Phornacisa piffardi* (Trans. Ent. Soc. Lond. 3rd series, I, p. 312, 1864) which was recently accidentally discovered by Sir George Hampson, has been previously overlooked by everyone. It most obviously applies to the species subsequently described by Morrison, and Walker's name label has been found beneath the Nova Scotian specimen in the British Museum, which, that being the locality mentioned by Walker, is, by assumption, the type.

*O. æqualis* Grote stands as a synonym of *major*, following Smith and Hampson. Types of both names are in the Museum, and I find it hard to believe that they are the same species. A pair of *æqualis* from Eureka, Utah, agree with the type, and I have a series of that in my own collection, but nothing like *major*, which is figured by Hampson. I understand that there is a type of *major* in the Neumoegen collection.

*Dunbari* Harvey makes its first appearance in *Oncocnemis*. It was redescribed as *definita* by the authors under *Oxycnemis*, but later they referred the name to Harvey's species. I recognized the type in the Henry Edwards' collection in 1910 as a species I had previously seen in one or two collections, but did not then possess, but I overlooked the fore tibial claw. I now have a specimen from Vancouver Island. The form

described and figured by Hampson as *dunbari* is probably a strongly marked form of *Lithalomia napæa*.

*Momophana* Grt. *Columbiana* Sm. stands as a variety of *comstocki* Grt. I am by no means convinced that they are the same species.

*Graptolitha* Hbn. *Winnipeg* immediately follows *laticinerea*. I consider them synonymous. *Merceda* (2159), should be referred to *unimoda* (2150). I compared Smith's type some years ago, and came to this conclusion. There is a co-type of *merceda* in the British Museum from Cartwright, Man. This specimen has the maculation clearer than eastern specimens, and being rather small, is undeniably *tepida*-like in appearance, but I am satisfied that it is really *unimoda*. *Atincta* stands as a variety of *tepida*. It seems to me an exact synonym. Heath used to send me *tepida* as both *atincta* and *merceda*.

The six names referred to *georgii* are correct, but questionably recognizable as standing for varieties.

*Conistra* Hbn. *Walkeri* is treated as a synonym of *sidus*, and *colorado* as a variety. The latter reference is new to me, but very likely correct. *Walkeri* I have never succeeded in recognizing as distinct, and am satisfied to accept the reference.

*Parastichtis* Hbn. is used for *Amathes* of Hampson, and *Orthosia*, part, of Smith. I strongly object to *verberata* being treated as a variety of *bicolorago*. I have pointed out the differences in my Alberta notes, and have since found that the genitalia differ. Nor do I believe that *acta* is distinct from *decipiens*. My tentative reference of *insipida* Strk. to *inops* Grt., made after seeing Strecker's type in 1910, has been confirmed by the authors. *Americana*, which Smith considered a probable foreigner, has been retained, and so has *immaculata* Morr., a species still unrecognized, I believe.

*Trachea* Ochs. *Ferida* Smith stands here, as per Hampson. I believe it to be a *Eumichtis*, and associate it very closely with *miniota* Smith. *Purpurissata* B. & McD., described from Vancouver Island, which happens to be the "*auranticolor*

ab. I" of Hampson, is referred as a var. of *antennata* Smith. I have nothing identified as the latter. *Separans* Grt. (2288) is best placed next to *indocilis* (2285), and *enigra* (2312) placed in the list between *commoda* and *illustra* should probably come next. I am of opinion that the first three named will ultimately prove to be forms of one species. The genitalia do not differ. *Obscura* Haw. (*gemina* Hbn.) of Europe has an almost exactly similar range of variation. *Illustra* is a black, almost immaculate var. of *commoda*.

*Probata* B. & McD. is correctly referred as a synonym of *fumeola* Hampson, and the re-description was explained by the authors in their "Contributions." Hampson's figure representing a different species from his type. I recognized the latter fact when I saw the British Museum series about ten years ago. Of the species figured by Hampson I had then a duplicate, but lacking other specimens, long held it under a mss. name. All the specimens mentioned in the catalogue except the type of *fumeola* are this species, and there is one in the collection from Fraser River, B.C., (Mrs. Nicholl). A few years ago I received it in some numbers from Miss McGlashan, from Truckee, Calif. Sir George Hampson intends to name it *perfumosa*. *Luteocinerea*, (2305), by my comparison with the type is a form of *characta* (2303). *Jocasta*, standing between these names, seems to me a very close ally of *claudens*, which is referred by Hampson and the authors to *Eremobia* Steph. I agree with the authors in considering *mixta* Grt. a good species. The resemblance of Grote's type is so very close that I had formerly passed it, and one other in the British Museum with it, as worn examples of *impulsa*. I have a specimen from Winnipeg from Mr. Wallis.

*Perigea* Gn. No. 2323 should read *xanthioides*, not *xanthoides*.

*Oligia* Hbn. *Modiola* Grt., with *mactatoides* B. & McD. as a synonym, stands as a variety of *fractilinea*, possibly as a result of the writer's suggestion in litt. *Misera* Grt. is very likely the same species. European *secalis* Linn. (*oculea* Linn.), of which *fractilinea* is the North American counterpart, has a

wide range of variation which practically covers all these forms.

*Agroperina obliviosa* Walk. is kept distinct from *lateritia*. I suggested this in Can. Ent. XLIII. p. 231, and Dr. McDunnough came to the same conclusion after examination of the type. I have examined it on several occasions since the publication of my note, and my opinion has weakened. It may be a sub-alpine form. *Satina* Walk. stands next. Though I have not seen the type a second time, I hold firmly to my original contention that this is *commoda* Walk. That *commoda* can sometimes resemble *lateritia* rather closely I have admitted in the course of my notes upon the Heath collection, but am quite satisfied as to the identity of Strecker's type. *Morna* Strk. is placed in the *conradi* group, where Hampson places it, and to which I have stated that it does not belong. I considered it a *Luperina*, and Smith a *Sidemia*. I assume that Messrs. B. & McD. have specimens compared with the type, or at least have recognized it, and as I have very rarely met with anything which I have suspected of being *morna*, and have nothing under the name in my collection, I must accept their word as to its associates. But the *morna* of Hampson is *indela* Smith.

The authors list *conradi*, *citima*, *pendina*, *lineosa*, *indela* and *inficita* as six species. *Pendina* is a red variety of *lineosa*. The more I study the others, the less am I able to separate them. My *identification* of *conradi* is possibly wrong.

*Eremobia* Steph. *Alticola* Sm. stands next to *maillardi* (*exulis*). If the British Museum specimen standing under Smith's name is correct, the close association seems fully justified.

*Sidemia* Staud. The writer's reference of *speciosa* Morr. to *devastatrix* is here confirmed. (Cf. Can. Ent. XXIV, p. 359).

*Luperina* Bdv. *Ona* Smith is placed next *burgessi*. They resemble one another closely, but *ona* appears to be a longer and narrower winged species, with heavier thoracic tufting, better placed in *Septis* Hbn. Hampson has it in the collection under *Parastichtis*, for which the authors substitute Hübner's name.

*Phuphena* Walk. All the specimens of *u-album* which I have so far had an opportunity of examining, and which have possessed hind tibiæ, have had a spine between the pair of spurs, and the species is, therefore, probably an Agrotid.

*Acronycta* Ochs. I had hoped to see fewer species here. I have found it difficult to get hold of much material in many groups of this genus, and so closely do some of the species approximate one another, that opinions formed from examination of too limited material of doubtful forms, are rather risky. The authors have seen far more than the writer, and the benefit of the doubt has probably favoured numbers. I am glad to see *modica* next *exilis*, but should like to see *clarescens* (2442) next *hæsitata* (2437), and *increta* (2452) next *inclara* (2444). The identity of *hamamelis* has again been under dispute. *Minella* I believe to be a variety of *fragilis*.

*Lepusculina cinderella*, *canadensis*, *populi* and *chionochroa* are certainly well placed very close together, but are very doubtfully five species. If *vulpina* Grt. and *sancta* Hy. Edw. are really forms of *leporina*, that may be North American after all, though I had decided that it was not. I still claim that *mæsta* is a variety of *cretata*, though it is here listed as distinct. *Eldora* Sm. stands as a variety of *americana*, probably correctly. *Distans* and *impressa* stand apart for future judgment. *Dolorosa* stands as a var. of *distans*, in accordance with its author's description, and *emaculata* as var. of *impressa*. I see no reason for separating *dolorosa* from *impressa*.

*Andropolia* Grt. *Illepida* seems correctly referred to *diversilineata*. The type material of *resoluta*, similarly referred, included an almost white variety.

*Hyppa* Dup. *Rectilinea* is on the "omitted" list, as not North American. *Xylinoides* replaces it in our fauna, but I find them more nearly related than I once thought.

*Pyrrhia* Hbn. The name *cilisca* is omitted, and *exprimens* and *stilla* are referred as varieties of *umbra*, with *angulata* a synonym of *exprimens*. The distinctness of *umbra* and *cilisca* is perhaps doubtful, but I think the omission of the latter

name was an oversight, even if *umbra* was to be retained. The genitalia of *exprimens* and *cilisca* differ, which supports my view as to their being two species. The treatment of *stilla* is new. I have only one specimen, from Dr. Barnes, and had suspected that it might quite possibly be a variety of *exprimens*, and have seen Vancouver Island specimens of the latter coming very near *stilla*.

*Ipimorpha* Hbn. I believe that *subvexa* (2726) is very likely a variety of *pleonectusa* (2724). I long ago suggested that *nanaimo* (2725) might be *subvexa*, but the authors keep the three distinct. I possess nothing named *nanaimo*, and am content to accept it as it stands for the present.

*Enargia* Hbn. *Infumata* Grt., with *punctirena* as a synonym, is listed as a form of *decolor* Walk. This is in accordance with Hampson. Had I not seen the two in nature side by side, and found one sometimes present in certain seasons without the other, I should probably have held the same opinion, and the male genitalia being alike would lend support to that view. As it is, I hold to my former opinion that they are two very closely allied species.

*Eutricopis* Morr. *Elaborata* Hy. Edw. is a form with the dark markings rather thickly irrorate with yellow scales. The placing of the name by the authors as a synonym of *nexilis* Morr. seems to indicate that the latter is of this form also. If that is so, then the much darker form with purplish or vinous red shades, found at a high altitude in the Rockies, deserves a varietal name.

*Catocala beaniana* Grt. This stands as a form of *unijuga*. The form was unknown to me until quite recently when I examined the type. It is very difficult for me to believe that the reference is correct. Dr. McDunnough has doubtless seen it, and confirmed Hulst's reference, which was followed by Smith.

*Cœnurgia* Walk. *Sobria* Walk. appears, as in Hampson, as a synonym of *crassiuscula*. Grote referred it to *erechtea*, and

that reference was followed by Smith. I refer *sobria* to *convalescens*. The type is a female, and agrees with the male type of *purgata* Walk. in maculation, though not in colour.

*Autographa* Hbn. The first twenty species here listed have mid and hind tibiæ spined, and are referred to *Syngrapha* by Hampson. *Ou* has all the tibia spined, a character which was somewhat overlooked by Hampson, or he would have placed it, with *pedalis*, in *Rachiplusia*. I agree with the authors of the new list in considering *pedalis* Grt. an abberation of *ou*.

*Russea* Hy. Edw. which Hampson followed Ottolengui in referring as a variety of *californica*, the present authors treat as a variety of *pseudogamma*, which I cannot believe to be correct. *Microgamma* Hbn. makes its first appearance in our lists, the only North American records, so far as I know, being from Alberta. In Europe it occurs in Austria, Northeastern Germany, Scandinavia, Lapland, Finland and Russia. *Sansoni* Dod is placed between *pasiphœa* and *metallica*. I consider its nearest ally to be *rubidus*. Its yellow underwings, however, dissociate it somewhat from others of the genus having smooth tibiæ.

*Drasteria* Hbn. *Capiticola* Walk. (3327), misspelt *capticola*, appears to the writer to be a synonym of *graphica* Hbn., and not distinct as listed.

*Syneda* Gn. The nearest ally of *petricola* Walk. (3331) is *athabasca* Neum. (3336), and I am by no means assured that they are not forms of one species.

*Pheosia dimidiata* H.-S. This is one of the familiar names which is included in a list of those omitted as not referring to North American species. It has long stood as prior to *rimosa* Pack., but the merest glance at Herrich-Schäffer's figure leads one to wonder who was responsible for the mis-identification. According to the British Museum collection the name refers to a South American species described latterly as *Rhuda endymion* Schaus., from Rio Janiero.

## ON SOME NEW OR NOTEWORTHY COLEOPTERA FROM THE WEST COAST OF FLORIDA.—IV.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

A further study of the Coleoptera collected by myself during the winter season of 1916-17, and those taken at porch light and sent me in June and July, 1917, has revealed the following species worthy of note or apparently undescribed. Unless otherwise mentioned, all the species were taken at or near Dunedin, a town on Clearwater Bay, 21 miles north of St. Petersburg, Florida.

**Platynus octopunctatus** Fab.—A single example of this handsome and easily recognized Carabid was taken February 13 from beneath rubbish on the site of a recently drained pond. Schwarz records one specimen from Tampa, and Leng has one or two from "Fla." In Western Indiana it occurs frequently in winter beneath cover on the slopes of sparsely wooded hills.

**Bidessus floridanus** Fall.—Of this species, which bears a close general resemblance of *B. pulicarius* Aube, a dozen or more specimens have been taken at Dunedin, and one or two at Sarasota and Kissimmee. Fall's types are from Jacksonville, and it probably occurs throughout the State.

**Celina grossula** Lec.—One specimen was taken at Gainesville on February 7. Schwarz records it as very rare at Enterprise and Jacksonville.

**Hydræna marginicollis** Kies.—This minute Hydrophilid occurs in small numbers beneath immersed boards in the ponds about Dunedin. Like *Notomicrus nanulus* Lec. it only becomes visible when it moves. Schwarz lists it as rare, but mentions no definite locality.

**Tropisternus sublævis** Lec.—No previous record of the occurrence of this species in Florida can be found. It was described from Nebraska and Georgia. Single specimens were taken at Dunedin on January 30 and February 23, and another at porch light on June 20.

**Ditoma carinata** Lec.—A single specimen was taken beneath the bark of a magnolia log at Gainesville on February 7. Recorded from Tampa and Enterprise by Schwarz.

**Bothrideres geminatus** Say.—A dozen or more taken on December 16 and January 6 from beneath the close-fitting bark of a dead water-oak. Crescent City (Schwarz in Mss.).

**Lathropus pictus** Sz.—One specimen taken March 6, while beating in a wet hammock. The types were found at Haulover beneath bark of a dead oak. Known also from Key West and Biscayne Bay.

**Loberus subglaber** Casey.—Occurs in numbers on the seablite, *Batis maritima* L., on Hog Island. Casey described it* from New Jersey, and this is the first published record for Florida.

**Hesperobænus rufipes** Lec.—Described† from the "Southern States," as "rare," and said by Horn** to occur in Missouri, Georgia and Louisiana. A dozen or more specimens were secured on December 24 from beneath the bark of an oak log.

**Tenebroides bimaculata** Melsh.—Though Horn says‡ that this species is common in the Southern States I can find no record of its occurrence in Florida. A single specimen was beaten from dead vines on March 6.

**Monocrepidius debilis** Lec.—This species was described[1] as an *Athous* from a single specimen taken at Lake Harney, Florida, in May. Three have been secured at Dunedin, two by beating in a wet hammock on March 22 and April 6, the other at porch light on July 10. The third joint of antennæ is at least one-fourth longer than the second, not equal to it as stated by LeConte. Tampa (Schwarz in Mss.).

**Monocrepidius aversus** Lec.—Two specimens at porch light, June 20—July 5. Described from Georgia as rare. No previous Florida record.

**Elater sturmii** Germ.—A single example was taken at porch light on June 12. Schwarz records one from Enterprise. It is known only from Florida.

**Ozognathus floridanus** Lec.—This species ranges from New Jersey to Texas. As pointed out by Fall, the head and thorax are

*Journ. N. Y. Ent. Soc., VIII, 1900, 83.
†Smithson. Missc. Coll., 167, 1863, 65.
**Trans. Am. Ent. Soc., VII, 263.
‡Proc. Phil. Acad. Nat. Sci., 1862, 87.
1. Proc. Am. Phil. Soc., XVII, 405.

often rufous, two of the four specimens at hand from Dunedin being thus bicolored. All were beaten from oak along the margins of ponds.

**Eutylistus tristriatus** Lec.—While ranging from Pennsylvania to Texas, this species is recorded from Florida only from Key Largo. Single specimens have been sifted from dead leaves at Dunedin on January 16 and March 21.

**Cis impressa** Casey.—A single male of this well marked form was taken at porch light on June 10. Chas. Dury, of Cincinnati, Ohio, who has in press a monograph of the family Cioidæ, has verified the determination. Casey's types were from California and Washington. Other members of the family taken at Dunedin are *Cis hirsuta* Casey, described from Lake Worth, common; *C. ursulina* Casey, described from Alabama, *Ennearthron pullulum* and *Ceracis punctulata* Casey, scarce. Several new species, descriptions of which by Dury will soon appear, have also been taken.

**Canthon perplexus** Lec.—One specimen taken at light on July 10. While it is said by Blanchard* to range from Illinois to California and Yucatan, no other Florida record can be found.

**Canthon probus** Germ.—One specimen was taken from a bucket of water on February 10. Schwarz records one only from Enterprise. Known also from Crescent City and St. Augustine.

**Copris inemarginatus** sp. nov.—Form of the common *C. anaglypticus* Say, but usually smaller. Clypeus shorter, its front margin *entire* and less reflexed, its surface punctures less distinct, more granulate. Thorax more shining with sides behind the front angles much less sinuate than in *anaglypticus*, the angles themselves not in the form of a small, obtuse tooth as there; sculpture much the same, but the punctures, especially those on sides, more distinct and ocellate; elytra with intervals more shining, less convex and wholly smooth instead of closely and minutely punctate as in *anaglypticus*. Front margin of prosternum without the small, obtuse tooth seen in that species. Both sexes with a very short, obtuse horn or tubercle at middle of head; front half of thorax wholly unmodified and much less declivous than in *anaglypticus*. Length 11.5–15 mm.

*Trans. Amer. Ent. Soc., XII, 1885, 167.

Described from 14 specimens taken at Dunedin, two beneath dead turtle on January 20, the others at porch light in June and July. In the Fall and Dury collections and in that of the American Museum of Natural History, this stands as *C. mœchus* Lec., a Texas species 19 mm. in length, with clypeus obtusely notched at middle, thorax sparsely and irregularly punctured and horns more strongly developed than in *anaglypticus*. Dury writes that his single specimen from Port Orange, Florida, was so named for him by Horn and Ulke, but that "it varies widely from LeConte's brief description of *mœchus*, and it cannot be *anaglypticus*." Fall states that "I have had this with the label '*mœchus*' for many years, but don't know on whose authority the identification rests. On looking at it now with the table in hand it does not seem possible that it can be *mœchus*. It certainly is not *anaglypticus*." Mutchler writes that the three specimens labeled "Fla." in the American Museum collection, agree with the description of *mœchus* only in having the thorax not opaque. Specimens in the U. S. National Museum from Enterprise, Fla., are labeled *anaglypticus* and H. S. Barber writes that both he and Mr. Schwarz believe that the species is "merely a depauperate form, due to biological conditions of which we are now ignorant, but which is not specifically distinct from *C. anaglypticus*. It is certainly not *C. mœchus* Lec."

As these most eminent living American Coleopterists cannot agree upon the name for this species, I have decided to give it that of *inemarginatus*. The "biological conditions" mentioned by Barber are doubtless prevalent throughout the peninsula of Florida, as the beetle seems to be widely distributed over that State. If they are sufficient to put the shine on its surface, take the notch out of its clypeus and put the punctures in its elytral intervals, it is certainly worthy of a distinctive name. If it be a mere form of *anaglypticus*, as Schwarz and Barber believe, then our conceptions of that species are wholly wrong, and all our tables of the genus *Copris* will have to be greatly modified.

**Trox erinaceus** Lec. Numerous specimens at carrion traps, February 5–24. The first published Florida record. Horn gives its range as New Jersey to Georgia and Indian Territory.

**Lachnosterna boops** Horn.—Frequent at porch light in June and July. Described from Northern Georgia; known also from Tampa, Crescent City and Indian River (Schwarz Mss.).

**Ecyrus dasycerus** Say.—A single specimen taken by beating dead vines in a wet hammock.

**Ataxia crypta** Say.—Two specimens in December by beating oak, one April 26, at porch light. Recorded by Schwarz as rare at Ft. Capron. Known also from St. Augustine, Crescent City and Key West.

**Monocesta coryli** Say.—Two specimens of this large Chrysomelid were recently sent me by Dr. E. W. Berger of Gainesville. They were taken at Palmetto, Fla., on July 3, where they were found feeding on elm. Horn* states that the beetle occurs in Virginia, Illinois and Kansas. It is also recorded from Missouri, but no reference to its occurrence south of that state can be found.

**Disonycha mellicollis** Say.—This species, known from Indiana to Louisiana and Texas, has been found about Dunedin only beneath boards near the edge of high tide along the beach of Clearwater Bay, where it occurs in small numbers throughout the winter. Known also from Ft. Capron.

**Epitrix fasciata** sp. nov.—Oval, moderately convex. Head and thorax dull reddish brown; elytra dull yellow with a broad median blackish cross-bar, this interrupted on the second and third intervals, thus forming an oblong sutural spot which is slightly prolonged forwards, and a large spot on each elytron; antennæ, legs and prosternum dull yellow, abdomen piceous. Head very minutely and sparsely punctate. Thorax two-thirds wider than long, sides feebly curved, front angles obliquely truncate, hind ones rounded; disc rather coarsely, deeply and closely, not densely, punctate, the ante-basal impression deep. Elytra at base but slightly wider than thorax, widest at middle, sides broadly rounded, umbone small, oblong; striæ with rows of large, rounded punctures separated by one-half their own diameters; intervals narrow, con-

*Trans. Am. Ent. Soc., XX, 61.

vex, each with a row of prominent semi-erect, yellowish hairs. Abdomen very sparsely and finely punctate. Length 1.6 mm.

Two specimens were swept from low herbage on Hog Island, opposite Dunedin, on April 2, one of which escaped from the net and avoided recapture. The type is unique in coloration and smaller than any species except *brevis*, from which, aside from colour, it differs in its much less convex form and deep, ante-basal impression.

**Haplandrus ater** Lec.—Two specimens were taken on January 6 from beneath the bark of a water-oak. Schwarz records it as rare at Tampa in decaying pine logs.

**Hymenorus elbertæ** sp. nov.—Elongate-oblong, moderately convex, shining, thinly clothed with semiprostrate, yellowish hairs. Head, thorax, antennæ, legs and prosternum uniform dull red; elytra fuscous-brown; under surface, except prosternum, dark reddish brown. Head rather finely and closely punctate; eyes large, separated by two-thirds their width; antennæ much more slender than in *densus*, third joint one-half longer than fourth. Thorax but slightly wider than long, sides parallel from base to middle, thence broadly curved and rounded into the apex, hind angles rectangular; disc with a faint, broad, longitudinal median impression, the punctures fine, ocellate, separated by about one-half their own diameters, their intervals minutely alutaceous. Elytra but slightly wider at base than thorax, sides parallel to apical third, then feebly curved to apex; striæ fine, their punctures small, close set; intervals feebly convex, each with three or four rows of minute, hair-bearing punctures. Under surface finely and sparsely punctate, the hairs of the punctures much shorter than those of elytra. Length 4.8–5.5 mm.

Described from seven specimens taken at porch light, June 12–July 11. Allied to *H. densus* Lec. but readily separated by its more slender subparallel form, wholly pale and more filiform antennæ, more shining surface and much finer sculpture of thorax and elytra. Named in honour of my daughter-in-law, Elberta H. Blatchley, of Dunedin, Fla., who has kindly collected for me this and many other interesting beetles during the summer months.

**Pseudariotus amicus** Casey.—One specimen, April 6. Casey described it from two specimens taken at Biscayne Bay, Fla., by Hubbard and Schwarz.

**Vanonus sagax** Casey.—A single example, April 6. Both this and the preceding, as well as a number of other interesting forms, as *Emelinus** *ashmeadi*, *Zonantes schwarzi*, *Sandytes ptinoides* and *Toxotropis floridanus*, have been taken only by sweeping ferns and other vegetation in Skinner's Hammock, a densely wooded, wet tract of several hundred acres located one mile northeast of Dunedin. Casey's types of *V. sagax* were from Indian River, Fla. It is known also from Crescent City.

**Epicauta watsoni,** sp. nov.—Elongate, subcylindrical. Black, above uniformly and densely clothed with grayish-yellow pubescence; antennæ black, legs piceous. Head with a narrow and deep median groove, its sculpture concealed; eyes large, rather coarsely granulated, not emarginate; antennæ with joints cylindrical, of equal thickness throughout, closely united, the second one-third the length of third. Thorax distinctly wider than long, sides straight, at apical third strongly obliquely convergent, hind angles obtuse; disc apparently smooth, but with punctures so minute as to be visible only under high power, and with a wide, deep, entire median groove which expands near base and apex. Elytra with sculpture concealed, their tips separately rounded. Under surface finely granulate-punctate, the pubescence less dense than that above. Length 9.5 mm.

One specimen taken on Compositæ near Gainesville, September 17, by Prof. J. R. Watson, the able entomologist of the Florida Agricultural Experiment Station, in whose honour I have given the name. Differs from all other known species of Section A of Horn in the form and sculpture of thorax. Messrs. Schwarz and Barber report that it is unlike anything in the National Museum collection and entirely unknown to them. In a manuscript "List of Coleoptera named for Mr. Chas. Johnson by John Hamilton and said to have been taken in the vicinity of St. Augustine,

*This was wrongly printed *Eleminus* on page 277 of the August No. of the Can. Entom.

Florida," which list has been loaned me by Mr. Schwarz, I find the following: "*Epicauta strigosa* and a n. sp., the female of which has the thorax smooth, impunctate, polished." It is very probable that the new species thus briefly mentioned by Dr. Hamilton is the one I have above described as *Epicauta watsonsi*.

**Anthonomus scutellaris** Lec.—Two specimens on March 9, by beating plum. In the "Rhynchophora of N. E. America," its southern range is given as Georgia and Texas. Bred from wild plum taken at Brookville, Fla., by P. H. Dorsett. (Schwarz Mss.)

**Anthonomus elegans** Lec.—On February 27 a single example of this handsome weevil was swept from the foliage of the mangrove, *Rhizophora mangle* L., on Hog Island. Known heretofore only from Haulover, Jupiter and Biscayne Bay on the east coast of Florida.

**Conotrachelus serpentinus** Boh.—One specimen taken March 6, by beating in the Skinner Hammock. Recorded only from Enterprise and Biscayne Bay.

**Acalles granosus** Lec.—Two specimens of this rare species were taken February 17 in company with *Anchonus duryi* and *Conotrachelus maritimus* beneath chunks of saw palmetto stems along the beach of Clearwater Bay; also recorded only from near the east coast.

**Cryptorhynchus helvus** Lec.—Of this rare species, known heretofore only by the unique type from Enterprise, Fla., I possess a single specimen kindly given me by H. L. Dozier. It was taken near Gainesville on June 26, 1916.

**Sphenophorus chittendeni** Blatch.—A fourth specimen of this distinct "bill-bug" was picked up December 21 from the sidewalk along the bay front at Dunedin. It evidently occurs only along or close to the sea coast.

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In order to be enabled to devote all of his time to closely allied economic work in the Agricultural Department of the University of Minnesota, Professor F. L. Washburn, for fifteen years State Entomologist, has asked and obtained the consent of the Board of Regents of the University to drop the State Entomologist work, with its attendant police and quarantine duties, this change to be effective February 6th, 1918.

# NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART IV.

BY CHARLES P. ALEXANDER, LAWRENCE, KANSAS.

Family *Tipulidæ*.
Sub-family *Limnobiinæ*.
Tribe *Eriopterini*.

**Erioptera (Erioptera) megophthalma,** sp. n.

Allied to *E. macrophthalma* Loew, *E. vespertina* O.S., etc.; coloration reddish yellow throughout; antennæ with the scape dark brown, the flagellum pale basally, passing into darker toward the tip; inner margins of the eyes broadly margined with silvery.

*Male.*—Length 5.5. mm.; wing 4.5–5.2 mm.

Rostrum and palpi dark brown. Antennæ with the scape dark brown, the basal flagellar segments light yellow, passing into dark brown toward the tip. Head with the front and the vertex adjoining the inner margin of the eye silvery white; remainder of head yellowish buff with an indistinct brown median line. Eyes of the male very large, contiguous across the ventral portion of the head, purplish black.

Thorax clear reddish yellow, including the pleura, not brightened on the humeral angles of the mesonotal præscutum (as in *vespertina*). Halteres pale. Legs golden yellow, the apical tarsal segments darkened. Wings with a pale grayish tinge, the veins pale, the costal region yellow.

Abdomen light reddish yellow with long, pale hairs; male hypopygium with the ninth tergite quadrangular, the apex squarely truncated, pleurites long, the dorsal appendage straight, pale, tipped with darker.

*Habitat.*—Northeastern United States.

*Holotype.*—♂, Bools Hillside, Ithaca, N. Y., reared from larva, June 3, 1917.

*Allotopotype.*—♀.

*Paratopotypes.*—25 ♂s ♀s; paratypes, ♂, Westchester Co., Tarrytown, June 9, 1914 (Frost); Fulton Co., Sacandaga Park, June 18, 1916 (Alexander); Herkimer Co., Indian Castle, June 9–13, 1915, (Alexander).

Type in the collection of the author.

Related to *E. macrophthalma* Loew (Europe). In our fauna closest to *E. vespertina* O.S. in the enlarged eyes of the male sex but differing in the clear, reddish brown coloration of the body, lacking the yellow humeral angles to the præscutum and the bright yellow knobs to the halteres. The male hypopygia are differently constructed in the two species.

*E. vespertina* is an inhabitant of open swamps and meadowlands, while *E. megophthalma* is characteristic of cool woods and boggy, shaded hillsides. I reared this new species from numerous larvæ, occurring in mud and beaneath rotting leaves, associated with other crane-fly larvæ (as *Dicranomyia stulta, Molophilus hirtipennis, Ormosia innocens, Limnophila fuscovaria, Rhaphidolabis flaveola, Tipula oropezoides, T. collaris, T. cayuga, Bittacomorphella, jonesi*, etc.) in the *Symplocarpus* association on Bools Hillside. The larva is curious in the chalky white colour due to the contents of the food-canal showing through the skin; the head-capsule and spiracular-disk are very small.

Tribe *Limnophilini*.

**Lasiomastix subtenuicornis,** sp. n.

Allied to *L. tenuicornis* O.S.; antennæ of the male elongated; apical cells of the wings pubescent; cell $M_1$ of the wings lacking.

*Male.*—Length 7 mm.; wing 7.4 mm.

*Female.*—Length 8.8–9 mm.; wing 8.8 mm.

Rostrum and palpi black, the former slightly pruinose. Antennæ of the male elongated, black, the flagellar segments elongate-cylindrical with a dense, whitish pubescence. Head light gray.

Præscutum brownish gray with three broad, dark brown stripes, the median one not attaining the suture; scutum, scutellum and postnotum blackish gray pruinose. Pleura dark with a clear, blue-gray pruinosity. Halteres yellow, the knobs a little darker. Legs with the coxæ dull yellowish, the two anterior pairs a little pruinose basally on the outer faces; trochanters yellow; femora yellow, passing into brown on the outer third; tibiæ and tarsi dark brown. Wings dusky gray; stigma brownish; veins dark brown; a sparse pubescence in the apical cells of the wings. Ven-

ation: cell $R_2$ sessile or very short-petiolate; cell $M_1$ lacking by the fusion together of veins $M_1$ and $M_2$.

Abdomen dark brown, the sternites paler; female ovipositor long, brownish yellow.

*Habitat.*—Northeastern United States.

*Holotype.*—♂, Bools Hillside, Ithaca, N.Y., June 4, 1917, (Alexander).

*Allotopotype.*—♀.

*Paratopotypes.*—3 ♂s, 2 ♀s, June 4–13, 1917.

*Paratype.*—♂, McLean, N.Y., May 31, 1913.

Type in the collection of the author.

Readily distinguished from *L. tenuicornis* O.S., its closest ally, by the lack of cell $M_1$ of the wings. The usual flight-period of the species is presumably in late May and the first week of June. The season of 1917 was very cold and backward, at least two weeks late by mid-June.

Sub-family *Tipulinæ.*

Tribe *Tipulini.*

**Tipula aperta,** n. n. for *T. imperfecta* Alexander.

(Proc. Acad. Nat. Sci. Phila., Sept., 1915, p. 484–485) not *T. imperfecta* Brunetti (Rec. Indian Museum, vol. 9, 1913, p. 260).

**Tipula sackeniana,** sp. n.

*Tricolor* group; close to *T. tricolor* Fabr.; coloration reddish brown; male hypopygium without a pencil of reddish hairs on the sides of the caudal margin of the ninth tergite.

*Male.*—Length 16.8–17.5 mm.; wing 15.5 mm.

*Female.*—Length about 18 mm.; wing 17.5 mm.

Frontal prolongation of the head with the dorsal half pale brownish yellow, the ventral portion darker, with a dark, lateral line; palpi dark brown. Antennæ with the scape dark brown; flagellar segments light yellow, the basal enlargement brown. Vertex light gray in front and very narrowly along the inner margin of the eyes; remainder of the vertex brownish gray with a narrow, brown line; an orange spot on the sides of the vertex at the narrowest part; occiput similar in colour.

Mesonotal præscutum light gray laterally, the stripes reddish brown, narrowly margined with brown, median stripe narrowly bisected by a dark brown vitta, the interspaces dark; scutum reddish brown; scutellum and postnotum yellowish brown. Pleura brownish yellow, the posterior half, including the coxæ of the middle and hing legs, white pruinose. Halteres light brown, the knobs brown. Legs with the trochanters yellow, the fore coxæ darker; femora dark brown, the basal portion brighter, tibiæ and tarsi dark brown. Wings like those of *T. tricolor;* reddish gray, the costal region darker, a broad, pale streak in cell *M* and the anal angle paler; hyaline obliterative streak interrupted before the stigma.

Abdomen reddish yellow, the sides of the basal segments more yellowish, the terminal segments a little darker, the caudal margins of the segments very narrowly silvery. Male hypopygium with the ninth tergite produced caudally into an elongate median lobe, rounded across its tip which is darkened; no pencil of reddish bristles near the base of this lobe as in *tricolor*.

*Habitat.*—Eastern United States.

*Holotype.*—♂, Difficult Run, Virginia, July 25, 1915, (Alexander).

*Allotype.*—♀, Falls Church, Virginia, Sept. 26, 1915, (McAtee).

*Paratopotypes.*—2 ♂s; *paratype.*—♂, Beltsville, Maryland, Aug. 8, 1915, (McAtee); ♂, Stone Mt., Georgia, Aug. 3, 1913, (J. Chester Bradley); ♂, Ithaca, New York, Aug. 26, 1914, (Alexander).

Type in the collection of the author.

Similar to *T. tricolor*, but the entire body much more yellow, the thoracic stripes more reddish, the abdomen reddish yellow with the terminal tergites scarcely darkened; ninth tergite of the male without a pencil of hairs on either side of the median lobe. *T. fraterna* is smaller, the thoracic stripes brownish gray, sides of the abdominal segments broadly infuscated and the femoral tips brown.

**Tipula aprilina,** sp. n.

*Dejecta* group; closely resembling *T. dejecta* Walker, except in the male hypopygium.

*Male.*—Length 11–11.2 mm.; wing 11.5 mm.

Region of the ninth tergite large, the caudal margin with the lateral angles produced caudad into prominent, blunt lobes that are blackened and furnished with small tubercles, the caudal margin truncated; between the lateral lobes two parallel, usually longer and slightly pointed lobes that are directed slightly ventrad, one situated on either side of the median line; outer pleural appendage very small, inconspicuous, elongate-cylindrical, yellowish; inner pleural appendage elongate, narrow; margins of the ninth sternite not widely separated beneath, carinated with a narrow, V-shaped caudal notch; at the point of the notch a pair of small, elongate, fleshy lobes.

*Habitat.*—Eastern United States.

*Holotype*—♂, Mount Vernon, Virginia; Apr. 16, 1916, (W. L. McAtee).

*Paratopotypes.*—2 ♂s.

Types in the collection of the U. S. Biological Survey.

In *T. dejecta* Walker, the caudal margin of the ninth tergite bears a broad median lobe that has its posterior portion produced into two flattened, divergent horns; outer pleural appendage prominent, elongate, curved; inner pleural appendage short and broad, the ninth sternite with a broad V-shaped notch.

**Tipula helderbergensis,** sp. n.

*Hebes* group; related to *latipennis* Loew.; general colour very dark; antennal flagellum uniformly brown; male hypopygium with the eighth sternite with a dense fringe of long, golden hairs.

*Male.*—Length 12–13 mm.; wing 13.8–14 mm.

*Female.*—Length 14.5 mm.; wing 14.4 mm.

Antennæ elongated, the flagellar segments dark brown throughout. Vertex behind dark gray with a diffuse, blackish median stripe.

Præscutum light gray with three darker gray stripes, the lateral stripes margined inwardly and anteriorly with darker; median stripe broadest, margined laterally with darker, the anterior portion likewise darker, somewhat blackish; scutum grayish, more brown medially, each lobe with two dark confluent blotches; scutellum brownish yellow, a little darker medially; postnotum

brownish, the anterior half most intense. Pleura silvery white, the mesosternum and mesopleura brownish. Halteres dark brown, the knobs and extreme bases of the stems pale. Legs with the coxæ yellow, the posterior coxæ dusted with white pollen; femora dull yellow, the tips dark brown; tibiæ and tarsi yellowish brown. Wings with the usual *hebes* pattern but this very heavy.

Abdomen brownish yellow, the tergites broadly margined with paler, and submargined with a narrow brown line, palest on the basal segments, on the fourth and succeeding tergites darker and suffusing the dorsum of the segments; on the five basal tergites with a dark brown, dorso-median line that is interrupted only by the pale, caudal margins of the segments; sternites brownish yellow, margined caudally with silvery, the eighth sternite dark brown, the lateral lobes margined inwardly with a dense brush of long, golden hairs. Male hypopygium with the eighth sternite with the caudal margin deeply incised, tripartite, the lobes fringed as described above. Blade-like process not of the elongate, spiral, horn-like structure of *latipennis* but flattened, the acute tips curved strongly downwards, the ventral carina obliquely and parallelly grooved or fluted; lower process longer, straight and more pointed, the expanded basal inner portion evenly rounded, suffused with brown, not rectangular or toothed, (as in *latipennis*) upper process a prominent flatted lobe, rounded apically, the whole lobe intensely chitinized, black, not at all hatchet-shaped as in *latipennis*. In *T. hebes* the lower process is very massive and with the basal inner portion produced proximad as an acute, chitinized spine; the blade-like processes very narrow toward the tip which is feebly expanded into a spatula; the upper process bifurcate, with two chitinized arms, the outer more pointed, the inner flattened and with the apex rounded.

*Habitat.*—Northeastern United States.

*Holotype.*—♂, Indian Ladder, Helderberg Mts., Albany Co., N.Y., July 3, 1916, (Alexander).

*Allotopotype.*—♀.

*Paratopotype.*—♂; *paratype.*—♂, Wells, Hamilton Co., N.Y., July 31, 1914, (Young); in the N. Y. State Museum.

Type in the collection of the author.

**Tipula huron,** sp. n.

Related to *T. submaculata* Loew.; wings with a heavy brown pattern.

*Male.*—Length 14 mm.; wing 15.6 mm.

Frontal prolongation of the head light yellow dorsally, more infuscated on the sides below, palpi light brown, the apical segments somewhat darker. Antennæ bicolorous, the flagellar segments beyond the first with the basal enlargement black, the remainder of each segment dull yellow. Anterior part of the vertex with three linear down dashes, the median one on the frontal tubercle. Vertex dusky gray with a brown more or less interrupted median line; occiput paler.

Præscutum pale gray with three broad, dark brown stripes, the median one broadly bisected by a reddish brown line; thoracic interspaces dull, infuscated; scutum light gray, the lobes brown, scutellum and postnotum dull brownish yellow. Pleura clear, light gray, the dorso-pleural membranes more yellow. Halteres brownish, paler basally. Legs with the coxæ whitish pollinose, the anterior coxæ more pink; femora dull yellow, the tips darkened; tibiæ dull yellow, the tips very narrowly darkened; tarsi brown. Wings hyaline or sub-hyaline with the costal region more yellow; a heavy brown and gray pattern arranged about as in *T. angulata*, *T. subfasciata*, etc. The brown areas including a large basal area, a blotch at the origin of the sector, along the cord and the wing-apex, all of these marks passing into gray on the caudal cells of the wing; a broad, white fascia beyond the cord extending entirely across the wing except the extreme apex of cell $M_4$. Venation: vein $R_2$ persists for its whole length.

Abdomen dull yellow above, the tergites indistinctly ringed caudally with silvery; tergites seven and eight, and the caudal portion of six, infuscated; an interrupted sub-lateral brown line extending from the middle of tergite two to the base of tergite five; sternites dull yellow. Male hypopygium very similar to *T. submaculata*, but the lateral points of the ninth tergites in the latter species are usually shorter and less acute.

*Habitat.*—Nothern United States.

*Holotype.*—♂, Dodge Co., Wisconsin, June 5, 1910.

Type in the collection of the author.

The species is closest to *T. submaculata* Loew., but in the heavy wing pattern bears a superficial resemblance to the *angulata* and *subfasciata* groups, from both of which the structure of the hypopygium will readily distinguish it. The thoracic pattern of *submaculata* is quite different, the median stripe being dissected by a very broad, pale line.

**Tipula fultonensis,** sp. n.

*Arctica* group; related to *T. longiventris* Loew., but the abdomen of the female is about half an inch shorter than in the same sex of that species (abdomen, *fultonensis*, 16 mm.; *longiventris* 26–27 mm.).

*Female.*—Length 22 mm.; wing 18.5 mm.; abdomen 16 mm.

Antennæ with the apical flagellar segments indistinctly bicolorous. Head dull gray, the vertex with a narrow, brown line.

Præscutum buffy with three broad, grayish brown stripes that are broadly margined with dark brown; thoracic interspaces without brown setigerous punctures; each lobe of the scutum with a small, anterior gray spot and a larger brownish area behind; postnotum gray with a narrow, brown median line. Pleura whitish gray pruinose. Legs with the coxæ grayish; femora dull yellow, the tips very pale brown; tibiæ similar; tarsi brown. Wings with a brownish, gray pattern.

Abdominal tergites dull brownish yellow, broadly trivittate with dark brown, the lateral margins of the abdominal segments dark brown basally, gray apically, the brown sublateral stripe being very sensitive on the basal portion of each segment, sternites grayish brown; valves of the ovipositor and the dorsal shield chestnut brown, the lateral margins of the valves with about ten acute teeth; extreme tips not divergent.

*Habitat.*—Northeastern United States.

*Holotype.*—♀, Mt. Buell, Sacandaga Park, Fulton Co., N.Y., altitude 1,500 ft., June 15, 1916, (C. P. Alexander).

Type in the collection of the author.

Compared with females of *longiventris*, the present species offers the following differences: thoracic dorsum buffy brown, rather than gray; wing pattern more brown, heavier; abdomen short; ovipositor and dorsal shield chestnut brown instead of almost black, and the tips are scarcely elongate and slightly divergent.

**Tipula bergrothiana,** sp. n.

*Arctica* group; related to *centralis* Loew., but smaller and the male hypopygium different; wings of female atrophied.

*Male.*—Length 10.5 mm.; wing 12.2 mm.

*Female.*—Length 17 mm.; wing about 2 m.

Frontal prolongation of the head grayish basally, more brownish apically; palpi brown. Antennæ with the scape rather bright yellow; flagellar segments rather uniformly brown, the basal enlargement a little darker than the rest of the segments and only slightly enlarged. Head with the vertex light gray, more suffused with brown behind and on the occiput.

Mesonotal præscutum gray, the median thoracic stripe almost obliterated, lateral stripes indicated only by the narrow, bright brown margins; remainder of mesonotum gray. Pleura dull gray. Legs with the coxæ brownish gray; trochanters and femora yellowish brown, the latter a little darkened outwardly; tibiæ and tarsi slightly darker. Halteres dirty pale brown, the knobs dark brown. Wings of the male elongate, in the type crumpled and this possibly the normal condition although the venation is not distorted. Wings brown and gray with hyaline areas as in *septentrionalis* Loew., etc.

Abdomen with the first tergite and the extreme base of the second gray, the remainder of the abdominal tergites brown; a dark brown median stripe; pleural membrane distinct dark brown, simulating a lateral stripe; sternites brown, the caudal margins narrowly pale. Male hypopygium small, simple, with the ninth tergite as in *centralis*, a shiny, heavily chitinized saucer, the caudal margin feebly concave medially to receive the inner pleural appendages; each caudal lateral angle produced into an acute tooth and the margin of the saucer on either side with a smaller similar tooth beyond mid-length. Ninth pleurite complete but small; outer pleural lobe moderate in size, flattened, the inner face somewhat convex, the outer face pale brown with abundant appressed hairs; a caudal inner angle of each pleurite produced dorsad in a somewhat similar flattened lobe whose outer face is shiny and abundantly provided with erect hairs; this lobe bends dorsad and somewhat cephalad inside the outer pleural appendage; ninth sternite with a deep, V-shaped median notch, beneath the point of

which the sclerite is elevated into a transverse ridge. Eighth sternite unarmed.

The female is similar to the male but the wings are greatly atrophied, the legs, especially the femora, incrassated and the tibiæ and tarsi shortened. The abdominal tergites are brown with a broad, basal median area of black on each segment, the caudal margins brighter; lateral margins of the segments pale yellowish, sublaterally with a blackish band. Ovipositor of the *arctica* type, the ends of the valves rather blunt, the dorsal edge with four or five sharp teeth, the lateral margin with seven or eight similar but larger teeth.

*Habitat.*—Alaska.

*Holotype.*—♂, Koyukuk R., Alaska; Lat. 67–69 N.; Long. 151 W. (W. J. Peters). Summer of 1901.

*Allotopotype.*—♀.

Types in the collection of the U. S. National Museum.

**Tipula macrolaboides,** sp. n.

*Macrolabis* group; related to *T. macrolabis* Loew of Northeastern North America but differing in the male hypopygium, the pleural lobes unarmed at their tips; the ninth tergite with an acute median lobe, the broad, lateral lobes deeply notched to form two smaller lobes.

*Male.*—Length 17–17 mm.; wing 17–18.6 mm.

Close to *macrolabis* except as follows:

Antennæ of the type light brown throughout, the paratype uniform pale throughout.

Præscutum light gray with four narrow, chestnut brown stripes, the median one divided by a very broad ground vitta, pointed anteriorly; lateral stripes shorter, continued back on to the scutal lobes.

Male hypopygium with the ninth tergite extensive, with a broad and deep dorsal depression; produced caudad into a compressed median blade with a sharp dorsal edge or carina; the broad lateral lobes are deeply notched by a rounded incision to form two smaller lobules on either side, the proximal lobule longest, shiny, the lateral one with a sharp edge that is provided with a few stout bristles. Ninth pleurite complete, the caudal ventral angle produced caudad and slightly dorsad and proximad as a promi-

nent slender arm (as in *macrolabis*) this expanded on its apical half into a flattened, paddle-like blade that is unarmed.

*Habitat.*—Western Arctic America, south along the mountains into New Mexico.

*Holotype.*—♂, White Mts., N. Mex.; highest summit (11,092 ft.) Aug. 14, (C. H. T. Townsend).

*Paratopotype.*—♂, South Fork of Eagle Creek, Alt. 8,000 ft. Aug. 13, (C. H. T. Townsend).

*Paratypes.*—♂, Saldovia, Alaska, July 21, 1899, (Trevor Kincaid) Harriman Exped., 1899. Previously reported by Coquillett as *T. macrolabis* Loew.; ♂, Hudson Bay Territory (Loew. collection in the M. C. Z., part of the type-material of *macrolabis*).

Type in the collection of the U. S. National Museum.

**Tipula coracina,** sp. n.

Coloration black and yellow; wings whitish subhyaline; male hypopygium simple in structure.

*Male.*—Length 9.8 mm.; wing 11.4 mm.

Frontal prolongation of the head short, black; nasus stout. Palpi dark brownish black. Antennæ blackish brown, the flagellar segments cylindrical, not incised; verticils very short, first flagellar segment with these bristles scattered, the remaining segments having them basal in position. Head black, finely punctured. Eyes with rather coarse ommatidia.

Pronotal scutum black; scutellum bright yellow on either side of the infuscated dorso-median depression Mesonotal præscutum black, the interspaces with a few scattered paler hairs; scutum black except on the sides behind the wing-root where it is obscure yellowish; scutellum and postnotum black. Pleura dark brownish black, the extensive dorso-pleural membranes yellowish. Halteres brownish yellow. Legs with the coxæ and trochanters black; femora yellowish basally, the remainder of the legs dark brown. Wings whitish with a pale brownish tinge; stigma ill-defined, brownish; veins dark brown. Venation: $R_2$ short, straight; $R_{2+3}$ longer than $R_2$ alone; cell $M_1$ open in both wings by the partial atrophy of vein $M_1$; cross vein $M$ very long and prominent, inserted just beyond the fork of $M$ on $M_{3+4}$.

Abdominal tergites and sternites dark brownish black, the segments broadly margined laterally and caudally with yellowish. Hypopygium simple, small; ninth tergite moderate in size; ninth

pleurite complete, elongate extending back to the eighth segment; outer pleural appendage an elongate fleshy lobe that is narrowed apically, clothed with long hairs that are directed backward; inner pleural appendage of somewhat similar structure, elongate, bearing on the inner face a small, sub-apical tooth; the surface is densely clothed with a short pubescence. Ninth sternite with a deep, V-shaped notch; eighth sternite unarmed.

*Habitat.*—Alaska.

*Holotype.*—♂, Point Barrow, Alaska, July 8, 1882 (John Murdock).

Type in the collection of the U. S. National Museum.

## OBITUARY NOTICE.

### WILLIAM D. KEARFOTT.

Canadian students of Lepidoptera will regret to record the death of William D. Kearfott, of Montclair, N.J., which occurred on November 12th, 1917, following an attack of apoplexy. Born in Berkeley County, West Virginia, on January 12th, 1864, he was thus, comparatively, a young man. We learn from Entomological News, January, 1918, that he was educated in primary schools in Richmond and Philadelphia. In his earlier years he was connected with the Morton Poole Company, of Wilmington, Delaware, and the International Navigation Company, of Philadelphia. He was associated also with the Worthington Steam Pump Company. Two years ago he formed the Kearfott Engineering Company. He was considered an authority on his branch of engineering.

Kearfott was a keen student of the Micro-lepidoptera, particularly of the family Tortricidæ, and was specially interested in Canadian species. During the years 1903 to 1908 he built up a large correspondence with collectors throughout Canada and, as a result, brought together a most important collection, particularly of the family mentioned. He was an exceedingly bright correspondent and ever ready to help us in the determination of specimens in the groups in which he specialized. Of late years, however, his eyes gave him considerable trouble, and he found it necessary to give up the study of the small moths he loved so well. His collection of Tortricidæ, which was particularly rich in Canadian material, is now in the American Museum of Natural History. His Pyralidæ is in the Barnes' collection.

Among the important papers which he published, those which relate to Canadian species are the following:

New North American Tortricidæ: Trans. Amer. Ent. Soc. XXXIII, 1—Twenty species from Canada described.
New Tortricids from Kaslo, B.C., and the Northwest: Can. Ent., XXXVI, 109, 137—Six species from Canada described.
A New Proteopteryx: Can. Ent. XXXVI, 306—Description of *P. willingana*, from Regina, Sask.
Coleophora tiliæfoliella Clem.: Can. Ent. XXXVI, 324—Description of adult found at Ottawa.
New Tortricids: Can. Ent. XXXVII, 9—Three Canadian species described.
A New Gelechid from Ontario: Can. Ent. XXXVII, 15—Description of *Aristotelia youngella* from Ottawa.
Assiniboia Micro-lepidoptera, Collected by Mr. T. N. Willing: Can. Ent. XXXVII, 41, 89, 119—Seven new species described.
Manitoba Micro-lepidoptera: Can. Ent. XXXVII, 205, 253, 293—A list of species taken chiefly at Aweme, Cartwright and Rounthwaite.
New Micro-lepidoptera: Can. Ent. XXXIX, 1, 53, 77, 121, 153, 211—Thirty species from Canada described.
New North American Tortricidæ and Tineina: Jour. N.Y. Ent. Soc. XVI, 167—Six species from Canada described.

In the above papers it will be seen that 69 new species from Canada are described. In these articles, in many instances, valuable larval notes are also included. His last paper published in this journal, entitled "A New Species of Japanese Micro-lepidoptera," appeared in October, 1910.

His business life was an exceedingly busy one, and it is remarkable that he was able to accomplish so much valuable systematic work. In one of his letters he told the writer that his business required nearly eleven hours' work a day.

In June, 1907, Mr. Kearfott paid a week's visit to Ottawa, and during that period the writer, Dr. Fletcher and Mr. C. H. Young, had many happy hours together at Meach Lake, Que., the Mer Bleue, and other attractive collecting spots near Ottawa. We all enjoyed Kearfott's bright, jovial company during this visit, and Mr. Young and the writer, the remaining two of the above quartette, will long remember the pleasant outings we had together.

Mr. Kearfott is survived by his wife, one son and one daughter.

ARTHUR GIBSON.

Mailed February 8th, 1918.

# The Canadian Entomologist.

VOL. L. LONDON, MARCH, 1918 No. 3

## POPULAR AND PRACTICAL ENTOMOLOGY.

### LIGHT TRAPS AS A MEANS OF CONTROLLING INSECT PESTS.

BY NORMAN CRIDDLE, DOMINION ENTOMOLOGICAL LABORATORY, TREESBANK, MAN.

Collecting at light, as it is popularly termed, has been a favourite method of securing certain kinds of insects, almost since the time when collecting was in its infancy, and that insects were so attracted was probably known before entomology, as we know it, was even dreamed of. We might, in fact, suspect it of being as ancient as the knowledge of fire itself. While the collector, however, has used this knowledge to procure specimens for his cabinet; it is only within recent years that attention has been called to the possible use of light traps as a means of controlling certain insect pests. On the face of it, what seemed easier? Moths and beetles, too, were known to dash themselves against the light, at times, in vast numbers. All that had to be done, then, was to place light traps at convenient distances apart and provide means for the destruction of the attracted insects. Indeed, a bonfire occasionally replenished would answer every purpose. The method was, in fact, a repetition of the candle and the clothes moth on a large scale. Yes, on the face of it there was certainly promise of success, but, alas, even a casual investigation soon brought other things to light. It was seen at once that the advocates of light traps had overlooked several important details and one important fact which in itself was sufficient to make the whole idea abortive. To begin with, insects are only attracted to bright light in comparatively limited numbers even under the most favourable weather conditions, among which may be mentioned warmth and cloudiness. A perfect night must combine these at a time when the moon is below the horizon or not visible, and provide, in addition, a stormy atmosphere with preferably a light rain falling. Such conditions occur but rarely, so much so, in fact, that they have been absent during the last three years. Thus, meteorological conditions alone, will often materially affect the value of

such means of controlling insect pests. A far more important consideration has to do with the proportion of males and females secured by light traps. Take *Feltia venerabilis* for instance; this is one of our commonest cutworm moths which is freely attracted to light, yet of the 192 specimens so secured all were males. Other species, with few exceptions, show very similar results. The Red-backed cutworm (*Euxoa ochrogaster*), while enticed to light on favourable occasions, was entirely absent during the three years experiments were carried on, though examples were secured close at hand at the time and larvæ had previously been very destructive. The proportion of hymenopterous parasites taken at light is also an important factor to be reckoned with. Lastly, we have to take into consideration the fact that at least some of the female moths collected will have already deposited a proportion of their eggs.

Below is given a table showing the records of captures for August and September for three years past—ending 1917. The collections of individual nights have been lumped for convenience. Two traps were used in the work, one of the usual search-light pattern, and the other a trap devised by my brother Stuart in which three sides were exposed to the light. These traps were placed in different localities where cutworms were known to have occurred. They were put out on practically every suitable night during the three seasons. The July results were too small to make them worth recording.

| | August | | September | | |
|---|---|---|---|---|---|
| Name of Species | Males | Females | Males | Females | Total |
| *Euxoa quadridentata* G. & R. | 52 | | 166 | 14 | 232 |
| " *ridingsiana* Grt. | 70 | | 23 | 95 | 188 |
| " *delersa* race *personata* Morr. | 74 | 4 | 60 | 16 | 154 |
| " *exculta* race *criddlei* Sm. | | | 7 | 3 | 10 |
| " *velleripennis* Grt. | 14 | | 8 | | 22 |
| " *tessellata* Harris. | 25 | 2 | 12 | 6 | 45 |
| " *albipennis* race *malis* Sm. | 12 | | 5 | 1 | 18 |
| " *redimicula* Morr. | 18 | 3 | 1 | 1 | 23 |
| *Feltia rubustior* Sm. | 10 | | 1 | | 11 |
| " *venerabilis* Wlk. | 23 | | 169 | | 192 |
| " *ducens* Wlk. | 370 | 40 | 17 | | 427 |
| *Agrotis collaris* G. & R. | | | 4 | 1 | 5 |
| *Lycophotia scandens* Riley | 7 | | 16 | 1 | 24 |
| *Sidemia devastator* Brace | 13 | 6 | 1 | 1 | 21 |
| Tipulid flies | 2 | | 5 | 3 | 10 |
| Ichneumonid flies | 281 | 6 | 692 | 27 | 1,006 |
| Braconid flies | | 46 | | 77 Sexes | 123 |
| Other Hymenopterous parasites | | 29 | | 5 not | 34 |
| Tachinid flies | | 2 | | 4 ascer- | 6 |
| Lace-winged flies | | | | 7 tained | 7 |
| Total moths collected | 688 | 55 | 490 | 139 | 1,372 |
| Total useful insects | | 364 | | 812 | 1,176 |

Micro-lepidoptera, comparatively harmless. Macros and numerous small insects of doubtful economic value are not included, though collected in considerable numbers.

Comparing the August catch with that of September it will be observed that there is generally an increase in the proportion of females in the latter month and a falling off in the males. This is doubtless due to the males being more active soon after emerging whereas the females become more so at the period of egg-laying. It will be noted further that the total number of moths collected only exceeds the number of useful insects taken by 196 specimens, or including the tipulid flies, 206.

Another point to be considered is that while the moths included in this table are all the parents of cutworm-like caterpillars by no means all are recognized as of economic importance. Thus we might reasonably leave out *Euxoa ridingsiana*, *quadridentata*, *criddlei*, *redimicula* and *Feltia robustior*.

Male insects seem to greatly exceed the females in nearly all orders attracted to lights, and the species of Ichneumonid flies are no exception to this rule. The Braconid flies, however, show a greater proportion of females attracted though males still predominate.

With reference to the destruction of June-beetles (*Lachnosterna* spp.) by means of light traps, the writer conducted a number of experiments relating to this subject in 1914, and it was found that while male beetles could be secured in considerable numbers, females were apparently only caught by accident, at least they did not constitute more than one per cent. of the total catch. As a matter of fact the females are far less active than the males and seem to be more concerned with feeding than flying about.

The facts brought out by this investigation seem to bear out very clearly the conclusions arrived at by other investigators, namely, that light traps are not a practical method of controlling insect pests, and that the number of noxious insects destroyed by this means is infinitesimal in any case. Moreover, when we take into consideration the useful insects secured at the same time we are left in doubt as to whether this method does not actually do more harm than good. There may be a time when certain pests, at present not thought of, may be controlled by means of artificial

lights. In the meantime, however, we must rely upon such remedies as tests have proved worthy of recommendation.*

## A PARTIAL KEY TO SPECIES OF THE GENUS AGROMYZA (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

It is my intention to publish keys to species groups of the genus Agromyza as aids to the identification of the numerous forms which have been described or recorded from North America. Up to the present time I have seen nearly ninety species of the genus from the United States. In order to make it possible for a serial magazine to present keys to this large number of forms I have divided the genus into arbitrary groups, the characters used in these divisions being enumerated in each instalment on the key.

The present key includes all species which have the *scutellum conspicuously yellow* either entirely or in part, *contrasting strikingly with the disc of the thorax.* The halteres in all the species are pale

1. Antennæ with at least the entire third joint black (cf. *variata*).....2
   Antennæ entirely yellow or at most with the third joint partly infuscated.....5
2. Frons black, only frontal lunule yellow. Food-plant unknown. Mexico; New Mexico.....*xanthophora* Schiner.
   Orbits black, interfrontalia reddish yellow; very small species (.75 mm.); body with exception of scutellum black; legs black, only knees yellow. Food-plant unknown. Wash.; Ill.....*interfrontalis* Melander.
   Frons yellow, ocellar region and sometimes orbits partly black; body with more than scutellum yellow.....3
3. Palpi and legs black. Food-plant unknown. Texas.....*quadrisetosa* Malloch.
   Palpi and greater portion of legs yellow.....4
4. Wings clear. Food-plant unknown. Wash.; Alaska; B.C.; Ill.....(*longispinosa* Malloch) *pacifica* Melander.

*For further reference on this subject see Stingerland's "Trap-lanterns or Moth-catchers." Bull. No. 202, Ithaca, N.Y., 1902.

Wings with a conspicuous infuscation along costa from apex of first vein to apex of second. Food-plant unknown. Ill.....*fumicosta* Malloch.

5. Mesonotum with the disc broadly black, the yellow of the lateral margins not carried entirely across on posterior margin ..... 6

Mesonotum with a large black or reddish mark on disc, the yellow of lateral margins connected along posterior margin, and usually a large subtriangular or subquadrate yellow mark on middle of posterior portion of disc.....10

6. Mesonotum with disc bare except for the dorso-central bristles.....7

Mesonotum with numerous short setulose hairs on disc in addition to the dorso-central bristles.....8

7. Mesonotum with 2 pairs of dorso-central bristles; cheek nearly as high as eye; last section of fifth vein twice as long as penultimate section. Food-plant unknown. Idaho.....*lima* Melander.

Mesonotum with 4 pairs of dorso-central bristles; cheek about one-third as high as eye; last section of fifth vein four times as long as penultimate section. Food-plant unknown. Arizona.....*discalis* Malloch.

8. Orbits glossy black; antennæ very small; pleuræ and abdomen almost entirely glossy black. Food-plant unknown. Ill.....*deceptiva*, sp. n.

Orbits yellow; antennæ of moderate size; pleuræ and abdomen largely yellow.....9

9 Small species, .75–1.5 mm. in length; last section of fifth vein 2½–3 times as long as penultimate section. Larvæ in serpentine mines in leaves of various legumes, cabbage, cotton, nasturtium, etc. U. S.; Canada; Europe.....*pusilla* Meigen.

Larger species, 2–2.5 mm. in length; last section of fifth vein 1½–2 times as long as penultimate section. Food-plant unknown. Cal.; Arizona; Europe.....*scutellata* Fallen.

10. Third antennal joint largely blackened; palpi blackened at apices. Food-plant unknown. Maine; Ill.....*variata* Malloch.

Third antennal joint and palpi not blackened, rarely the former brownish at insertion of arista.....11

11. At least 4 more or less regular rows of setulose hairs between the dorso-central bristles on mesonotum.....12
At most 2 irregular rows of setulose hairs between dorso-centrals on disc of mesonotum.....16

12. Mesonotum with the discal black marking opaque. Food-plant unknown. B. C.....*borealis* Malloch.
Mesonotum with the discal mark either reddish or entirely glossy black.....13

13. Cheek posteriorly about half as high as eye; arista almost bare. Food-plant unknown. N.M..*flavonigra* Coquillett
Cheek posteriorly less than half as high as eye; arista pubescent.....14

14. No posterior setulæ on mid-tibiæ; posterior margin of mesonotum with a broad, yellow band which is not anteriorly dilated centrally. Larvæ mine leaves of walking-leaf fern. N. Y.; Ill.....*felti* Malloch.
Each mid-tibia with 2 distinct setulæ; posterior margin of mesonotum with a large subquadrate yellow mark in center.....15

15. Mesonotum with discal marks entirely black. Larvæ mine leaves of *Plantago major*. U. S.; Canada; Europe.....*melampyga* Loew.
Mesonotum with discal mark largely reddish, only posterior extremities and lateral margins black. Larvæ mining in *Paspalum*. S. C.; Ill.....*marginalis* Malloch*.

16. Third antennal joint larger than normal in this group, the upper margin sharply angulated at apex. Food-plant unknown. Ill.....*angulicornis*, sp. n.
Third antennal joint small, rounded at apex. Food-plant unknown. Ill.....*assimilis*, sp. n.

**Agromyza deceptiva**, sp. n.

*Female.*—Glossy black, with reddish yellow and lemon-yellow markings. Occiput, ocellar triangle, and frontal orbits glossy black; frontal stripe, antennæ, and upper portion of face reddish yellow; cheeks yellow, with a narrow, black margin; proboscis

*Originally described as a variety of *melampyga* Loew.

and palpi yellow; arista blackish. Scutellum except at base on each side, and a large, subquadrate area on margin of mesonotum between base of wing and humerus lemon-yellow. Abdomen entirely glossy black. Legs black, femora lemon-yellow. Wings slightly brownish-tinged, especially on anterior half. Squamæ with margins and fringes blackish. Halteres cream-coloured.

Head large, viewed in profile the face is distinctly retracted below, orbits clearly differentiated from central stripe, each about half as wide as latter; orbital bristles 5 in number, long and slender; cheek twice as high posteriorly as anteriorly. Mesonotum with 4 pairs of dorso-centrals, the anterior 2 pairs very weak; discal thoracic setulæ numerous and rather long; scutellum with 4 long marginal bristles. Abdomen short and broad; ovipositor conical but not tubular. Legs stout; mid-tibia without posterior setulæ. Costa to apex of fourth vein, the latter ending in apex of wing; inner cross-vein below apex of first and at middle of discal cell; last section of fifth vein about 1.5 as long as preceding section.

Length 2 mm.

Type locality, Alto Pass, Ill., May 8, 1917 (J. R. Malloch).

This species bears a strong resemblance to *quadrisetosa* Malloch, but may be readily separated from that species by the colour of the legs, palpi and antennæ.

**Agromyza angulicornis,** sp. n.

*Male.*—Yellow, slightly shining, conspicuously marked with black. Head yellow; ocellar region, greater portion of occiput, clypeus, and arista black or blackish. Dorsum of mesonotum with a black mark similar to that on *melampyga*, the yellow prescutellar mark subquadrate; disc slightly pruinose; the following parts each with a black spot—humerus, propleura, mesopleura, pteropleura, sternopleura, and hypopleura; scutellum with a black spot on each side, postnotum black except on upper margin. Abdomen infuscated on dorsum; hypopygium glossy black. Legs yellow, tibiæ and tarsi black. Wings slightly grayish, veins dark brown. Halteres yellow.

Anterior ocellus situated further proximad of posterior pair than it is in *pusilla* and allied species, the sides of the triangle being unequal; frons narrowed anteriorly, its anterior width being distinctly less than half that of head; antennæ larger than usual

in the *melampyga* group, the third joint distinctly angulated above at apex; arista microscopically haired; cheek anteriorly as high as width of third antennal joint. Mesonotum with 4 pairs of dorso-centrals, the disc bare except for a few setulose hairs arranged in 2 irregular rows between the dorso-central series and another in line with the latter. Femora rather stout. Wing venation similar to that of *melampyga*, differing in having the third and fourth veins subparallel from middle of their last sections to apices; inner cross-vein one-third from apex of discal cell; last section of fifth vein nearly 3 times as long as preceding section.

Length 1 mm.

Type locality, Waukegan, Ill., August 25, 1917, (J. R. Malloch). Taken on shore of Lake Michigan. Food-plant unknown.

This species resembles *pusilla* Meigen, but differs from it in having fewer fine hairs on disc of mesonotum and in having the prescutellar yellow mark. From all species known to me it differs in having the third antennal joint angular at apex above.

**Agromyza assimilis,** sp. n.

*Male.*—In colour this differs from the preceding species in having the tibiæ and tarsi yellow, indistinctly clouded with fuscous, and the yellow prescutellar mark on mesonotum triangular, its anterior extremity being pointed.

Structurally the principal differences lie in the shape of the third joint of the antennæ, which is considerably smaller and disc-like, in the position of the ocelli, which are in an equilateral triangle, and in the venation, the third and fourth veins being gradually divergent throughout the entire length of their apical sections. The dorsum of the mesonotum has even fewer short hairs than that of *angulicornis*, but a single irregular series appearing between the dorso-centrals.

Length 1 mm.

Type locality, Freeport, Ill., July 4, 1917, (J. R. Malloch). Food-plant unknown.

This species strongly resembles *pusilla* Meigen, but differs in having the disc of mesonotum with fewer short hairs between the dorso-centrals, and a conspicuous, triangular yellow mark on posterior margin.

## SUPPLEMENTARY NOTE ON THE ANTHOMYIID GENUS PHYLLOGASTER (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

Since sending my paper, on the genus *Phyllogaster*, which appeared in Can. Ent., XLIX, p. 227–228, 1917, I have read C. W. Johnson's paper in the April number of the same volume, in which he describes a new species of this genus under the name *robustus*. An examination of paratypes of *robustus* discloses the fact that in addition to the difference in size between the species and *cordyluroides* the male may readily be separated from the latter and also from *littoralis* by the presence of a large number of strong bristles on the basal dorsal segment of the hypopygium (two in the others) and the much larger pulvilli which exceed in length that of the apical tarsal joint, whereas in the others they are much shorter than it. The female of *robustus* has two thorns on apical abdominal segment, *littoralis* has four, the female of *cordyluroides* is unknown to me. As in *cordyluroides* the third vein of the wing is bare in *robustus*.

## THE GENUS HADRONEMA UHL. (MIRIDÆ; HETEROPTERA.)

BY EDMUND H. GIBSON, U. S. BUREAU OF ENTOMOLOGY.

The flower bugs of the genus *Hadronema* Uhl. constitute an interesting little group closely allied to the genus *Lopedia* Uhl. species of which are known to most collectors of insects, such as the common Phlox bug. Those of *Hadronema* may be distinguished from the species of *Lopedia* by the fact that the base of the vertex is strongly carinate across its whole width.

Most of the species are of western occurrence, though, *militaris* Uhl., the haplotype of the genus, is distributed over the entire United States and Southern Canada. Little is known of the economic importance of the species, and in all probability they are but little restricted in food preferences.

The genus belongs to the division *Lopediaria* Van D. of the tribe *Orthotylini* Van D. and was characterized by Uhler as follows: Aspect of *Lopus*, cranium somewhat convex, face almost vertical, eyes prominent, oval, almost vertical; occiput with a

high, transverse carina between the eyes; tylus a little prominent narrowing towards the tip; cheeks short and blunt; bucculæ narrow, shorter than the basal joint of the rostrum; that joint subcylindrical, robust, a little longer than the head. Antennæ short, about as long as the corium and cuneus united, stout; the third and fourth joints of nearly equal thickness, not tapering to a setaceous termination; the latter less than one-half the length of the preceding. Pronotum trapezoidal; the angles rounded; the collum forming an obtuse, narrow collar, and behind it is an arcuated carina abbreviated a little way from the lateral margins; the lateral edges prominently carinated. Costal margins of the hemelytra almost straight, parallel.

*Hadronema* was described by Uhler in 1872 in the Rep. of the U. S. Geol. Survey, page 412. The genus now contains 7 species, two of which are herein described as new.

KEY TO THE SPECIES.

1. Third joint of antennæ distinctly shorter than second.....3
   Third joint equal to or longer than second.....2
2. Third joint of antennæ slightly longer than second.....*festiva* Van D.
   Third joint about equal in length to the second.....*picta* Uhl.
3. Pronotum red or with red markings.....4
   Pronotum black or gray, devoid of any red markings.....*splendida* n. sp.
4. Costal margin of corium and cuneus broadly bordered with white or cream.....*militaris* Uhl.
   Costal margin of corium and cuneus very narrowly if at all, bordered with white or cream.....5
5. Basal joint of antennæ comparatively long and slender, a distinct light spot at anterior margin of cuneus.....*princeps* Uhl.
   Basal joint of antennæ comparatively short and stout, no distinct light spot on cuneus.....6
6. Anterior margin of pronotum slightly sinuate.....*robustus* Uhl.
   Anterior margin of pronotum not at all sinuate.....*confraterna* n. sp.,

### Hadronema militaris Uhl.

*Hadronema militaris* Uhler, Rept. U. S. Geol. Surv., p. 412 1872.

The largest member of the genus. Elytra black with wide, light coloured costal borders.

Distributed over the entire United States and Southern Canada.

### Hadronema robusta Uhl.

*Hadronema robusta* Uhler, Proc. Cal. Acad. Sci., ser. 2, vol. IV, p. 250, 1894.

Distinguished by the bright red pronotum and scutellum and lack of colour marking on cuneus. Occurs from Kansas to Texas and west to the Pacific Coast.

### Hadronema confraterna, n. sp.

General form of *robusta* Uhl., slightly shorter and more narrow. Head nearly vertical, strongly convex. First joint of antennæ comparatively short and stout, third joint distinctly shorter than the second. Antennæ black, head black except for border next to and under the eyes red, cheeks red, bucculæ whitish, rostrum dark red. Pronotum red with large black collosities, deeply depressed anteriorly at the middle, anterior border of pronotum convex, posterior border sinuate at the middle. Pronotum much broader than long, and much wider posteriorly. Scutellum very dark wider than long. Elytra red becoming dark towards inner margins, no markings on cuneus. Membrane smoky. Legs dark red to black. Abdomen red along borders, whitish below. Plate dark red or black. Size 4.2 mm. long, 1.2 mm. wide.

Distinguished from *robusta* by the shape of the anterior margin of pronotum, the larger callosities, and colouring, especially of the elytra and scutellum.

Described from a single male specimen from Las Cruces, N.M. Taken on Bigelovia. Type in the U. S. National Museum.

Describing a species from a single specimen is here warranted, although it is diverging from good practice.

### **Hadronema princeps** Uhl.

*Hadronema princeps* Uhler, Proc. Calif. Acad. Sci., ser. 2, vol. IV, 1894.

A much narrower form than the other species with usually a distinct light mark on the cuneus. Occurs throughout the West.

### **Hadronema picta** Uhl.

*Hadronema picta* Uhler, Colo. Exp. Sta. Bull. No. 31, p. 31, 1895.

Separable from the other species in having the second and third joints of the antennæ equal in length. Recorded as occurring in Colorado and Dakota.

### **Hadronema festiva** Van D.

*Hadronema festiva* Van Duzee, Trans. Am. Ent. Soc., vol. XXXVI, No. 2, p. 80, 1910.

The only species of the genus having the third joint of the antennæ longer than the second. Also readily distinguishable by the radically different colour markings.

Mr. Van Duzee records its occurrence in New Mexico.

### **Hadronema splendida,** n. sp.

Resembles *festiva* Van D. Head small, vertical, black with light markings next to eyes, near base of head, on the centre of the face, and below the antennæ. Bucculæ bordered with white. Antennæ black, third joint noticeably shorter than second. Pronotum dark gray or black, callosities black, anterior border of pronotum light. Scutellum red. Elytra greenish white, smoky at middle of corium, clavus smoky along inner margin, cuneus white except smoky at apex. Costal border of elytra whitish. Membrane smoky. Abdomen dark beneath but light at the middle. Femora bright orange red, tibia and tarsi black. Size 3.8 mm. long, 1.2 mm. wide.

Described from a female collected at Albuquerque, N.M., Aug., 1909, now in the U. S. National Museum.

The peculiar colour markings readily separate this species from all others.

# A NOTE ON THE OCCURRENCE OF ABDOMINAL SPIRACLES IN THE COCCIDÆ. (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

Abdominal spiracles have been noted in but a limited number of species of Coccidæ and when noted seem usually either to have been passed over as of no particular significance or to have been regarded as evidence that the forms possessing them are merely aberrant. Savage, (1) who has described the tracheal system of *Monophlebus stebbingi* var. *octocaudata* Green, seems to have believed that the abdominal spiracles in this species are an adaptation to meet the needs occasioned by the extraordinarily large size of this particular insect. In a few cases they have been regarded as of some taxonomic significance. The genus *Perissopneumon* Newstead was based partially upon the fact of their presence and they are noted among the generic characters of the genera *Stigmacoccus* Hempel and *Cryptokermes* Hempel, while Pergande based his sub-family Xylococcinæ partially upon them, stating (2) that, "In the true Monophlebinæ the abdominal stigmata are wanting or not observable; . . ."

Newstead (3) stated in 1901 that abdominal spiracles are present in *Stigmacoccus* and *Perissopneumon*, but that, . . this peculiarity does not exist in any other Coccid," and Savage (ref. cit.) repeated this statement in 1914. As a matter of fact it was erroneous when first made for such spiracles had been recorded in the case of *Cryptokermes brasiliensis* Hempel which was described in the same paper as was *Stigmacoccus*, in the case of *Xylococcus betulæ* Perg. and also in some of Maskell's species of *Cœlostomidia* (= *Cœlostoma*). In 1903 Newstead (4) recorded the discovery of abdominal spiracles in certain species of *Orthezia*, stating that, "The presence of abdominal spiracles in the three species of *Orthezia* hereafter described is a marked characteristic, and one which has not hitherto been observed in this sub-family of Coccidæ." Here he was again in error, for the abdominal

(1) Savage, R. E. The tracheal system of Monophlebus stebbingi var. octocaudata. *In* Bul. Ent. Res. 5: 45–7: pls. 5–9. (1914).

(2) Pergande, T. Bul. 18, u.s., U. S. Dept. Agric., Div. Ent., p. 26. (1898).

(3) Newstead, R. Mon. Brit. Coccidæ, vol. 1 : 15. (1901).

(4) Newstead, R. Mon. Brit. Coccidæ, vol. 2 : 227. (1903).

spiracles of *Orthezia cataphracta* (Shaw), one of the three species discussed by him, had been noted by List (5) in 1887 in an exhaustive paper dealing with the anatomy of this species. However, Newstead does, indeed, appear to have been the first to note their presence in any other species of this genus.

As far as I am at present able to determine the following list includes at least the genera in which abdominal spiracles have been noted, although it probably does not include all the species, some descriptions not being accessible. In the subfamily Monophlebinæ there are recorded the genera *Stigmacoccus* with one species, *Perissopneumon* (perhaps not a synonym of *Stigmacoccus* as it has been regarded) with two species, and one species of *Monophlebus*. In the Margarodinæ there are the genera *Xylococcus* with four species, *Steingelia* with two, *Stomacoccus* with one, some of the species of *Margarodes*, and at least two of *Cœlostomidia*. In the Dactylopiinæ there is but the monotypic genus *Cryptokermes*. In the Ortheziinæ there are three species of *Orthezia*.

On the face of these records it would appear that the presence of abdominal spiracles has indeed but little significance and their occurrence might well be taken as evidence of aberrancy, the more so as most of the species in which they are recorded are curious enough in other respects as well. However, an examination of even the limited number of species available to me for study has shown that these records are extremely misleading. In short, abdominal spiracles are present in several forms in which they have not been noted and are in all probability present in many others.

The most surprising fact is that they appear to have been overlooked in such a well known species as *Icerya purchasi* Maskell, as well as in at least two other species of this genus. In *I. purchasi* Maskell two pairs are present, while in *I. seychellarum* (Westw.) and *I. aegyptiaca* (Dougl.) there are at least three. The original description of *I. jacobsoni* Green is not available and I do not know if they have been noted in this species, but in specimens from the Philippine Ids. (det. Cockerell) there are at least two pairs. In all these species the spiracles are situated toward the posterior

(5) List, J. H. Orthezia cataphracta Shaw. *In* Arbeiten a. d. zool. Inst. zu Gratz, 1-; 5 : 201–278 : pl. 1–6. (1887).

end of the abdomen. It is, perhaps, after all, not so surprising that they have not been observed for they are quite small and difficult to find among the many pores, spines and cicatrices, even in well stained preparations, but that they are really spiracles has been clearly demonstrated for it is possible to see the tracheæ proceeding from them.

Three other species belonging to the Monophlebinæ are at hand, these including *Paleococcus plucheæ* (Ckll.), *Drosicha burmeisteri* (Westw.), (det. Kuwana) and *Drosicha corpulenta* (Kuwana), and in none of these have abdominal spiracles been recorded. My single specimen of *Paleococcus plucheæ* (Ckll.) shows at least one pair but is in too poor condition to decide whether or not there are more. Both the species of *Drosicha* show seven clearly distinguishable pairs.

Of the species of Margarodinæ in which these spiracles have not been noted there are at hand specimens of *Kuwania quercus* (Kuwana) and *Kuwania* (?) *zeylanica* (Green). In the former there appear to be but four pairs, these being on the anterior segments, and in the latter there are eight, of which the posterior two are so much reduced as to amount to but little more than points of attachment for the tracheæ.

In the Orthéziinæ abdominal spiracles have been seen only in the three species noted by Newstead, *O insignis* (Dougl.), *O. cataphracta* (Shaw) and *O. urticæ* (Linn) but they are present in *O. californica* Ehrh., *O. galapagoensis* Kuwana and in an undetermined species of which I have specimens. In *O. californica* I note seven pairs, but in the other two species examined by me the material is in too poor condition to permit conclusions as to the real number. Newstead apparently does not state the number in the species examined by him, but List has recorded seven pairs in *O. cataphracta* (Shaw). Newstead states that he has not been able to trace them in *Newsteadia floccosa* (De Geer), nor have I been able to find them in *Nipponorthezia ardisiæ* Kuwana.

The monotypic genus *Cryptokermes* Hempel, which possesses abdominal spiracles, forms an extremely discordant element even in such an aggregation of disharmonies as the subfamily Dactylopiinæ (of the Fernald Catalogue) to which it is now referred. Specimens of *C. brasiliensis* Hempel, (Mexico, det. Cockerell) are

at hand and are sufficient to show that the species has been thoroughly misunderstood and that it cannot be referred to this subfamily. It is, in fact, a member of that group, whatever it may eventually be called, that includes the present subfamilies Monophlebinæ and Margarodinæ, although it cannot be referred to either of these groups as they are at present defined for it seems to combine the characters of both. I shall discuss the species at some length in a later note.

The facts here presented are too few to permit of any very sweeping generalities, yet they are suggestive enough and I present them at this time, in spite of their fragmentary character, in order to call attention to them and to their possible significance.

It will be noted that, with the exception of the species of *Orthezia*, all the forms in which these spiracles have been noted belong to the two subfamilies Monophlebinæ and Margarodinæ. Conversely, it is possible, if indeed not probable, that all the members of these groups will eventually be found to possess such organs. It, therefore, appears that we may have available a taxonomic element that has not been fully utilized and that may throw a considerable amount of light upon the relationships of these forms. Whether or not the presence of abdominal spiracles is any evidence of a close relationship between the Ortheziinæ and the other two subfamilies remains to be seen, but there is some other evidence that the present division between the Monophlebinæ and the Margarodinæ is by no means as clear as it has been thought.

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The Board of Regents of the University of Minnesota at their meeting on January 18th elected Dr. W. A. Riley, of Cornell, Professor of Parasitology and Chief of the Division of Economic Zoology. Associate Professor A. G. Ruggles was, at the same time, appointed Station Entomologist, which position carries with it the office of State Entomologist. At the December meeting of the Board Professor F. L. Washburn, who has held the position of State Entomologist in Minnesota for nearly sixteen years, asked and obtained permission to be relieved of that position and its attendant police duties, and the action of the Board on the 18th was necessary to fill the vacancy thus caused.

# APHIS SALICETI (KALTENBACH), SIPHOCORYNE PASTINACÆ (LINN.), AND ALLIED SPECIES.

BY C. P. GILLETTE AND L. C. BRAGG, FORT COLLINS, COL.

It is the object of the authors of this paper to give the results of their studies on a half dozen species of aphides that are quite similar in general appearance, and all but one of which have the willows for their winter hosts, in the hope that they will clear away some confusion and prevent further mixing of data. We believe we have the structural characteristics and food habits well enough worked out so that these species may be readily separated, whether from their winter or summer hosts, by use of the following simple key:

Cornicles cylindrical or slightly tapering.

Pre-caudal spine on dorsum of 8th abdominal segment.....*Aphis theobaldi*, n. sp.

No pre-caudal spine on 8th abdominal segment *Aphis saliceti*.

Cornicles distinctly clavate.

With pre-caudal spine on 8th abdominal segment,

Joints 4, 5, 6 and spur sub-equal.....*Siphocoryne capreæ*.

Spur equal to joints 4, 5 and 6 combined.....*Siphocoryne essigi*, n. sp.

Without pre-caudal spine on 8th abdominal segment,

Antenna shorter than the body.....*Siphocoryne pastinacæ*.

Antenna longer than the body.....*Siphocoryne grabhami*.

In order that others interested in these species may look up the literature readily, we are giving references to the more important papers:

## **Aphis saliceti** Kaltenbach.

*Aphis saliceti*, Monographie der Fam. der Pflanzenläuse, p. 103, 1843.

Koch, Die Pflanzenläuse, p. 118, 1857.

Buckton, Monograph of British Aphides, vol. II, p. 52, 1879.

*Siphonophora salicicola*, n. sp., Thomas, Bul. 2, III, St. Lab. Nat. Hist., p. 8, 1878.

*Aphis salicicola*, Monell, Bul. 5, U. S. Geol. Surv., p. 24, 1879.

Oestlund, Aphididæ of Minn., p. 63, 1887.

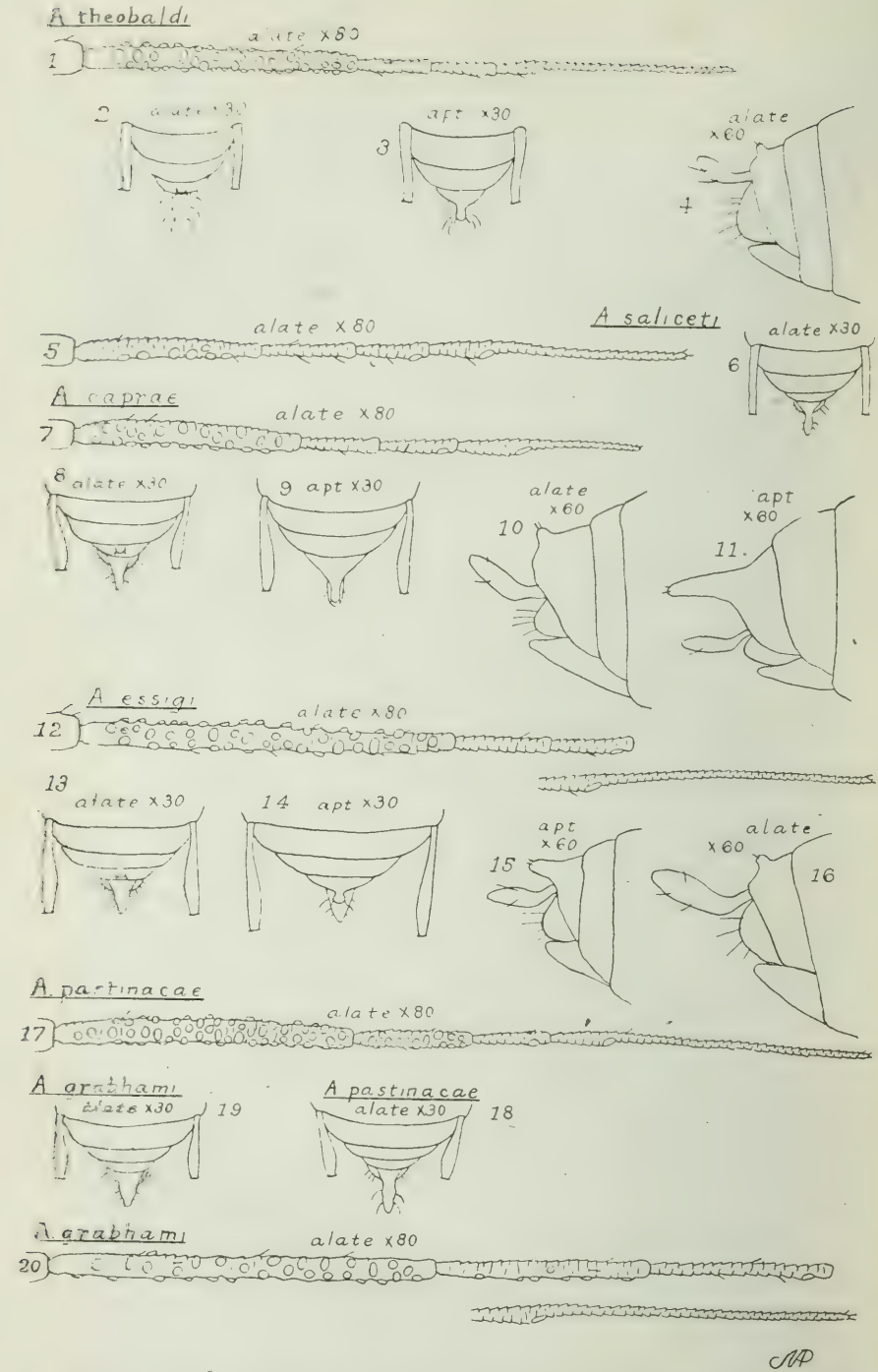


Figure 1—4, *Aphis theobaldi*; 5—6, *A. saliceti*; 7—11, *Siphocoryne capreae*; 12—16, *S. essigi*, n. sp.; 17—18, *S. pastinacae*; 19—20, *S. grabhami*. Original, Miriam A. Palmer Delineator.

*Aphis salicola*, Cowen, Hemip. of Colo., Bul. 31, p. 121, 1895.
Morgan, Jour. Exp. Zool., vol. VII, p. 301, 1909.
*Aphis salicicola*, Davis, Jour. Ec. Ent., vol. 3, p. 490, 1910.
Williams, Aphididæ of Neb., Univ. Studies, vol. 10, No. 2, p. 55, 1910.
*Aphis saliceti*, Theobald, Rep. on Ec. Ent. for 1912, p. 84 (*theobaldi*).
*Aphis salicicola*, Davidson, Jour. Ec. Ent., vol. 5, p. 408, 1912.
Patch, Bul. 213, Me. Exp. Sta., p. 81, 1913.
*Siphocoryne saliceti*, Borner, Blattlausstudien, in Abhand, Naturwiss. Ver. Bremen, XXIII, pt. I, p. 164, 1914.
*Aphis saliceti*, Van der Goot, Beiträge zur Kenntnis der Holländischen Blattläuse, p. 225, 1915.

The *salicicola* of Thomas is undoubtedly a synonym of *saliceti* Kaltenbach, and the cases where the specific name is given as "*salicola*" are errors in spelling, Cowen being the first offender, and others following.

This species is of special interest because of the cytological work done upon it by Dr. N. M. Stevens and Dr. T. H. Morgan. We happen to know this is the species that was worked with as specimens were submitted to us by Dr. Morgan for identification. It differs from the others mentioned in this paper in its habit of remaining upon the willows throughout the year, and seems not to have an alternate summer host. It is also peculiar among the aphides, that deposit over-winter eggs, in that the sexual forms appear very early in the summer. We have taken the males and oviparous females at Fort Collins as early as June 20, and the eggs before the end of June. We know no other species approximating it in this respect. Our records for the capture of the sexual forms are as follows:

Woods Hole, Mass., June 29, 1909, L. C. Bragg.
Geneva, N. Y., June 30, 1909, C. P. Gillette.
Fort Collins, Colo., July 14, 1910, L. C. Bragg.
" " " June 17, 1912, L. C. Bragg.
" " " June 20, 1912, L. C. Bragg.
Lansing, Mich., July 12, 1912, C. P. Gillette.
Fort Collins, Colo., July 30, 1912, L. C. Bragg.
Manitou, Colo., June 14, 1917, L. C. Bragg.

We also have viviparous lice in the collection taken as follows:
Russia, 1893, N. Cholodkovsky.
Mass., 1909, T. H. Morgan.
Webster, Mass., June 19, 1909, L. C. Bragg.
Lyons, Colo., June 11, 1916, L. C. Bragg.
Fort Collins, Colo., June 11, 1917, L. C. Bragg.

Dr. Stevens, in her paper, referred to above, states that Kyber, in his paper on "Einige Erfahrungen und Bemerkungen über Blattläuse in Germar's Magazin der Entomologie, 1815, records finding sexual forms of what was, undoubtedly, this species, on willow in June, and she also reports taking the sexuales on June 29 at Harpswell, Maine.

**Aphis theobaldi,** n. sp.

*Aphis saliceti* Kalt., Theobald, Rep. on Ec. Ent. for 1912, p. 84.

The presence of the pre-caudal spine, or produced eighth abdominal tergite, and the cylindrical cornicles, are characters that readily separate this species from the others mentioned in this paper. It seems to be the species described and figured by Theobald in his Report on Economic Zoology for 1912, page 84, and Plate XIII, and Figure 24. The species is one having alternate food habits, and may be described from our material as follows:

*Alate Viviparous Female.*

From specimens mounted in Canada balsam. Head, thorax, antennæ, tarsi and distal ends of tibiæ, black or blackish; abdomen greenish or yellowish; cornicles cylindrical, .28 long, or about as long as the spur of the antennæ and yellowish in colour; cauda barely one-half as long as the cornicles; a short, blunt tubercle on the median line of the 8th abdominal tergite; antennæ nearly reaching the base of the cornicles; 1.13 long; joint III with about 40 strong tuberculate sensoria and longer than joint VI with the spur; spur as long as joints IV, V and VI combined; length of body, 1.50; wing venation normal.

Described from specimens taken at Geneva, N.Y., July 1, 1909.

*Apterous Viviparous Female.*

From specimens mounted in Canada balsam. Colour, a uniform yellowish brown, probably green or yellowish green in

life: legs, antennæ and cornicles yellow, with tips of antennæ and tarsi black; cornicles yellow and nearly cylindrical, slightly tapering and curved outward at the distal ends; .40 long, or fully as long as joint VI of the antenna with its spur; length of antenna, 1.20; joint III without sensoria; cauda rather broad and spatula-like; or pre-caudal tergite, a somewhat knobbed tubercle, fully half as long as the cauda, projecting directly above it and bearing two prominent hairs; antennæ and legs sparsely set with short, stout, blunt hairs that can hardly be said to be capitate; length of body, 1.60. See figures.

Described from specimens taken along with the alate viviparous females at Geneva, N.Y.

Both alate and apterous forms, in every respect like those described above, were taken at the same place and date on flower heads of *Heracleum* species, and we have also taken it from celery, Webster, Mass., 6, 19, 1909, so there can be little doubt but that this species also alternates between the willows and umbelliferous plants as in the cases of *capreæ* and *essigi*.

**Siphocoryne capreæ** (Fabricius).

*Aphis capreæ*, Ent. Syst. Nat., IV, 221, Syst. Ent. 217; Syst. Rhyng., p. 294, 1803.

Kaltenbach, Monographie der Pflanzenläuse, p. 109. 1843.

*Rhopalosiphum capreæ*, Koch, Die Pflanzenläuse Aphiden, p. 37, figs. 46–47, 1857 (not this species).

*Rhopalosiphum cicutæ*, Koch, Die Pflanzenläuse, p. 24, 1857.

*Rhopalosiphum pastinacæ*, Koch, Die Pflanzenläuse Aphiden, p. 41, figs. 52–54, 1857.

*Siphocorynæ capreæ*, Passerini, Gli Afidi, 1860.

*Siphocorynæ pastinacæ*, Buckton, British Aphides, vol. II, p. 24, 1879.

*Rhopalosiphum salicis*, Monell, Bull. 5, U. S. Geol. Surv., p. 26, 1879.

Thomas, 8th Report St. Ent. III, p. 194, 1879.

*Siphocoryne salicis*, Weed, Trans. Am. Ent. Soc., vol. XX, p. 297, 1893.

*Siphocoryne angelicæ*, Œstlund, Aphididæ of Minn., p. 70, 1887.
*Rhopalosiphum capreæ*, Gillette, Jour. Ec. Ent., vol. IV, p. 320, 1911.
*Siphocoryne capreæ*, Theobald, Rep. Ec. Zool. for 1912, p. 87.
*Siphocoryne capreæ*, Essig., Univ. of Calif. Tech. Bull., vol. I, No. 7, p. 342, 1917.

**Siphocoryne essigi**, n. sp.

*Hyadaphis pastinacæ*, Essig, Pomona Jour. of Ent. 1911, p. 534.

This species which was well described and figured by Essig, differs from *pastinacæ* by having the pre-caudal spine, and from *capreæ* by the long antennal spur and in other ways.

**Siphocoryne pastinacæ** (Linn.).

*Aphis pastinacæ*, Fauna Suecica, p. 259, 1761.
*Aphis xylostei*, Schrank, Fauna Boica, p. 107, 1801.
*Aphis pastinacæ*, Fabricius, Systema Rhyngotorum, p. 269, 1803.
*Siphonophora pastinacæ*, Buckton, vol. II, p. 24, 1879 (capreæ).
*Hyadaphis pastinacæ*, Schouteden, Mém. Soc. Ent. Belgique. p. 229, 1906.
*Hyadaphis xylostei*, Davis, Jour. Ec. Ent., p. 493, 1910.
*Rhopalosiphum pastinacæ*, Gillette, Jour. Ec. Ent., pp. 320–322, 1911.
*Rhopalosiphum xylostei*, Gillette, Jour. Ec. Ent., p. 320, 1911.
*Hyadaphis pastinacæ*, Essig, Pomona Jour. Ent., p. 534, 1911.
*Rhopalosiphum xylostei*, Murtfeldt, Jour. Ec. Ent., vol. 4, p. 226, 1911.
*Syphocoryne pastinacæ*, Theobald, Rep. on Ec. Zoology for 1912, p. 88.
*Syphocoryne xylostei*, Essig, Univ. of Cal. Tech. Bull., vol. I, No. 7, p. 324, 1917.

While Linnæus took his *pastinacæ* from *Pastinaca sativa*, and Schrank took his *xylostei* from the European honeysuckle, *Lonicera xylosteum*, we now know that the latter food plant is an overwinter host for *pastinacæ*, and, as the descriptions of these species do not differ in any important particular, we believe *xylostei* should be considered a synonym of *pastinacæ*.

**Siphocoryne grabhami.** Cockerell.

Canadian Entomologist, vol. XXXV, p. 342, 1903.

# ODONATA OF THE RED DEER DISTRICT.

(Continued from page 103, Vol. XLIX).

BY F. C. WHITEHOUSE, RED DEER, ALTA.

In the introduction to my original publication I expressed the opinion that it would be slow work to lengthen the Odonata list in the vicinity of Red Deer to any extent. This has proved correct during the 1917 season, since I have succeeded in adding but one species. From 11th to 19th July, however, I devoted my time to collecting at Nordegg, Alta., the site of the Brazeau Collieries Ltd., situated 120 miles due west and, I should judge, just within the Hudsonian zone. The result of such collecting so far as the Odonata are concerned, was to add eight additional species to my list, and these of such special interest as to warrant a supplementary article.

Dr. Walker has kindly examined the material, and given the manuscript critical reading.

As in the prior list, the first numbers are my series, and the second refer to the pages of Muttkowski's catalogue.

## Cœnagrionidæ.

CŒNAGRIONINÆ.

28–65. *Nehalennia irene* Hagen.

July 1st, north end Gaetz Lake, Red Deer, I saw a pair in coitu, but failed to take them. July 2nd, at the large slough north of the river, I captured a male and female. July 8th, 2 males at "run" of stagnant water west of Gaetz Lake.

All the insects were of adult colouration, and all were flying down among the slough grass. I was not previously familiar with this species, which probably accounts for my failure to note it last year. However, I am convinced that it is not common in this district—at least around waters where most of my collecting has been done. New to Alberta list.

29–66 *Cœnagrion interrogatum* Selys.

At Nordegg, 19th July, 30 couples of this rare insect were taken in probably less than half an hour and within a space of 50 feet. In the morning in question my friend Mr. K. Bowman, of Edmonton, was giving the Lepidoptera a short respite and me his his kindly assistance. At one time we had five couples in our

nets, i. e., more than all previous captures of *interrogatum* up to that time. All the insects were fully adult and flying in coitu.

Dr. Walker's descriptions and illustrations of this species are so thorough that little remains to be said. In the long series, however, one very obvious colour variation attracted attention, viz., that in several of the males, dorsal view, the black marking nearest the thorax (segment 3) is not pointed, but a plain black band.

For three seasons I have been on the lookout for *interrogatum*, and have made a practice wherever I noticed insects of the genus flying to capture a few for examination. At the slough in question I had examined both *resolutum* and *angulatum* before coming upon the prize. Now that I have located the spot where the insect may be described as *common*, it might be well to record it. It is the round slough north of the track, to be seen from the train just before pulling into Nordegg. The water is about eighteen inches deep and abounding with "suckers." The bottom is soft mud and free from weeds, though, at the margins, a slight fringe of reeds rises from the moss. A tamarack swamp adjoins the pond.

Of the specimens taken I placed 12 couples in alcohol and papered the balance in pairs. New to Alberta list, and most westerly record.

## Libellulidæ.

### CORDULIINÆ.

30–129 *Somatochlora albicincta* Burmeister.

At Nordegg between 12th and 19th July I took some 18 males and 3 females of this species. Of these two or three were captured at the top of what is locally known as Coliseum Mountain, 6,500 feet, one or two at the camp 1,200 to 1,500 feet below, and the balance down in the valley, say 4,000 feet. On 19th July, 13 males and 1 female were captured at the round slough described above (see C. interrogatum) flying with *S. hudsonica* and *C. shurtleffi*. On that day I searched the mossy edges of the pond for nymphs and took a number of exuviæ of *Æshna eremita*, which was in company with *A. juncea*, on the wing there and a series of what on circumstantial evidence should be *S. albicincta*.

With regard to the adults of *albicincta* that I captured, there was one feature in the general appearance that immediately

enabled me to distinguish them from *hudsonica*, quite apart from the appendages, viz., the impression that the white bands are interrupted dorsally.

31–129 *Somatochlora cingulata* Selys.

At the mountain camp at Nordegg on the evening of 14th July something flew by over the spring of water that looked like a huge *Somatochlora*, with *pink* bands. Next afternoon among the small spruce on the mountain top I was sweeping with my net at a female of *franklini* at rest on a spruce, when something large settled about a foot away. I diverted the sweep of the net to take the larger fly, for I had a good series of *franklini* and preferred to settle the identity of the insect. Then I put my arm in the net and drew out my captive, a large *Somatochlora* with pink bands. The July number of the Can. Ent., vol. XLIX, containing Mr. Kennedy's article on the cingulata group, had not arrived when I left Red Deer for Nordegg, and the insect was unknown to me. Of course, I realized that the pink bands were probably only teneral colouration, but that, and the identity of the insect could wait, what I must find was a male. But I saw no more *Somatochlora* of the required dimensions that day, nor the next. On the morning of July 17th July (to be my last on the mountain) I found three flying together on the top, close to where I had taken the female, but I seemed out of luck. One I took a risky flying shot at and struck with the rim of the net. It went off into the empyrean. Another I missed at rest on a spruce, at least it did not wait long enough, but thoroughly frightened, also went off into space. The third I stalked, on and off, for three or four hours. It would rest on the small spruce frequently, the long abdomen hanging quite perpendicularly, but never would it give me the chance I desired, and I dare not take a risky shot. At last the moment came. At rest on the extreme tip of a spruce bough and not too high. I crept nearer and nearer; then struck up with maximum speed. I had him at last—yes, a beautiful young male just at his prime.

During the next two days in the valley below, 4,000 feet, I saw no more of this species. The pair I took are in alcohol. New to Alberta list.

32–130 *Somatochlora franklini* Selys.

On the top of Coliseum 11th July I took 2 females of *franklini* flying with males of *S. minor*. It was not until the 14th that I captured any more, when I got 4 and also four males. On the 15th I took more females, the 16th more males and females, and the 17th again females only. I have a good pair in alcohol, but the insects were mostly but passing from the teneral stage, and among the papered specimens the percentage of casualties is regrettably high. I did not take, nor see, any of this species in the valley.

The wings of the females varied in the tinting considerably, due doubtless to some extent to the period since emerging. The darkest shade is best described a "smoky black." Like all the Somatochloras that I took on the mountain *franklini* rested frequently on spruce, etc., but the fact must not be overlooked that all the mountain specimens of this and the other species were young insects. New to Alberta list.

16–131 *Somatochlora hudsonica* Hagen.

At the round slough at Nordegg 19th July I took three males of *hudsonica* flying with *S. albicincta* and *C. shurtleffi*. Mr. Kennedy points out in his article (referred to above) that my 1916 captures at Red Deer are the only record for this insect, except the original three types taken 1861 at Ft. Resolution, Hudson Bay territory. The dates of my 1916 captures were given in my prior list, those of 1917 are as follows: Red Deer, 1st July, 3 males at the same "run" of still water north of Gaetz Lake; and the 3 males at Nordegg 19th July. In all I have, therefore, taken 13 specimens of *S. hudsonica*, of which only one was a female. The Red Deer and Nordegg insects were of about the same age, accountable, of course, to the change from Canadian to Hudsonian zone. Mr. Bowman, who has studied this point somewhat carefully in the Lepidoptera, informs me that he finds in the case of most species that occur both on the prairie and in the mountains there will be an average difference in appearance of two to three weeks.

33–131 *Somatochlora minor* Calvert.

July 11th on top of Coliseum, Nordegg, 2 females, flying among

the spruce. From that date to 18th July I took 12 more males and 12 females. The captures of 18th July, a male and female, were taken at the slough by the Forestry Station in the valley, 4,000 feet. The insects were all fresh and some damage occurred to the papered specimens. New to Alberta list.

34–132 *Somatochlora semicircularis* Selys.

At the camp, Coliseum Mountain, in the evening 16th July, I took a male at rest on a spruce. I immediately realized from the general appearance that the insect was distinct from the other somewhat similar species that I had been taking, i. e., *franklini*. Not only was it larger and had a relatively greater wing spread, but the abdomen, flattening to some extent in the process, attained its greatest girth at segments 6 and 7, and tapered again to segment 10, while in *franklini* the most robust segments are 7 and 8, and the reduction in 9 and 10 very slight. I have the specimen in alcohol. *Semicircularis* has previously been recorded from Banff and Laggan.

35–132 *Somatochlora septentrionalis* Hageri.

On the morning 18th July I had been collecting at the sloughs each side of the trail at the Forestry Station. At noon I was knee deep in slough when the Forestry Officer hailed me to come up to lunch. Dripping water, I climbed through the fence, and there in the enclosure I saw a *Somatochlora* flying in the shade of a Jack pine. If I had refrained from taking it from laziness, hunger or politeness, that fine male of *septentrionalis* would never have been captured, and I should not have taken eight different species of *Somatochlora* at Nordegg in nine days. The specimen is in alcohol. New to Alberta list.* .

36–132 *Somatochlora walshii* Scudder.

A single female was taken on July 15th on the top of Coliseum. It was mistaken for *minor*, which it resembles very closely except in the form of the vulvar lamina.

Beside the 15 species of dragonflies dealt with, or indirectly

*A female evidently of this species, though differing from the published descriptions and figures of *septentrionalis* in the form of the vulvar lamina was also taken by Mr. Whitehouse on the top of Coliseum on July 12.—E. M. W.

mentioned, in the foregoing, it might be well to record others observed at Nordegg between 11th and 19th July, viz., *Lestes uncatus;* 1 female on top of mountain; *Æshna sitchensis*, 2 males on top of mountain, *Libellula quadrimaculata*, numbers at slough at Forestry Station; *Sympetrum rubicundulum decisum*, common on top of mountain and in the valley, *Leucorrhinia borealis* 2 males on top of mountain; *L. hudsonica*, common on mountain top and in the valley.

While the object of the collecting trip on the Coliseum Mountain was not solely dragonflies of the genus *Somatochlora*, the hopes of taking such insects was certainly one of the strong inducements. Just why I believed that I should find them on the top I do not know, and having found them another question presents itself. What are they doing there? It is not their true home as it is to the mountain-top butterflies *Colias nastes*, *Brenthis astarte*, etc., for these live there absolutely, and never descend to lower altitudes. In the case of dragonflies whether *Somatochlora* or any other genus this is clearly impossible, for there is no water. The insects must have passed the aquatic stages in the ponds, lakes, muskegs and creeks of the valley below, and with equal certainty they must return to the valley for ovipositing. I have already stated that all the insects taken on the mountain were young ones—many barely out of the teneral stage, and further that a male of *S. minor* would be found flying with females of *franklini*, and in the same way males of *albicincta* with females of *minor*. In other words they had not reached the stage when they must concern themselves with the next generation. My opinion, based on my observations, is as follows: that the teneral *Somatochlora* upon emerging aspires to higher altitudes and, judging from my captures at the camp, travels up the sheltering ravines in its journey to the top. Arriving there, it feeds; plays in the sun-lit glades of spruce or Jack pine; rests frequently and having reached the breeding stage once more returns to the valleys. This being the case it is clearly not *necessary* for the collector to work the mountain top at all. I think, however, that it may have one advantage, viz., that a representative variety of species, raised over a number of square miles of valley below, are conveniently assembled within a limited area.

# LECTOTYPES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÈ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from Vol. L, page 33.)

**Mesoleptus variabilis.** (Faun. 1883, p. 759, not Nat. Can. 7, p. 115). Type.—Female, yellow label 682. 2nd Coll. Pub. Mus., Quebec.

**Mesoleptus variabilis.** (Nat. Can. 7, p. 115, not Fauna 1883, p. 795). Type.—Male, yellow label 1080, name label *Mesoleptus muliebris* Cress. 2nd Coll. Pub. Mus., Quebec. Apical joints of hind tarsi gone.

**Mesostenus albicoxus.** See *Phygadeuon.*

**Mesostenus albifacies.** Type.—Female, blue label 553; yellow label 1583. 2nd Coll. Pub. Mus., Quebec. Fair, somewhat oily.

**Mesostenus apicalis.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon finitimus* Cress.

**Mesostenus armatus.** Type.—Female, Harrington Coll. Pink label "P. 416."

**Mesostenus brevipennis.** Type.—Not in Pub. Mus., Quebec, unless under *Mesostenus promptus* Cress. This synonymy indicated by Provancher's annotated copy of Fauna.

**Mesostenus collinus.** Type.—Not in Pub. Mus., Quebec, unless under *Cryptus eburneifrons* Prov.

**Mesostenus flavipes.** Type.—Male, yellow label 459. 2nd Coll. Pub. Mus., Quebec. Fair.

**Mesostenus jocosus.** Type.—Female, yellow label 304. 1st Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

**Mesostenus latigaster.** Type.—Female, Harrington Coll. Pink label "P. 407." Abdomen broken off and when glued on covered propodeum.

**Mesostenus longicornis.** Type.—Not in Pub. Mus., Quebec,, unless under *Mesoleptus moveni* Prov.

**Mesostenus nitidus.** Not Grav. See *Phygadeuon nitidulus.*

**Mesostenus nobilis.** Type.—Female, yellow label 1049.

2nd Coll. Pub. Mus., Quebec. Left antenna gone and apices of right wanting.

**Mesostenus pallipes.** Type.—Not in Pub. Mus., Quebec, unless under *Mesoleptus triangularis* Cress.

**Mesostenus pluricinctus.** Type.—Harrington Coll. Pink label "P. 462." Davis has labeled this *Diacritus muliebris* Cress.

**Mesostenus ruficornis.** Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon nitidulus* Prov.

**Mesostenus ruficoxus.** Type.—Not located. =*provancheri* D. T.

**Mesostenus rufocinctus.** Type.—Not located.

**Mesostenus sagax.** Type.—Female, yellow label 522. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna and apex of right.

**Mesostenus saint-cyri.** Type.—Not in Pub. Mus., Quebec, unless under *Echthrus abdominalis* Cress.

**Mesostenus tarsatus.** Type.—Not in Pub. Mus., Quebec, unless under *Cryptus americanus* Cress.

**Metacolus conicus.** Type.—Female, yellow label 1365. 2nd Coll. Pub. Mus., Quebec. Fair.

**Meteorus gracilis.** Type.—Female, yellow label 1264. 2nd Coll. Pub. Mus., Quebec. Poorly mounted on tag. Antennæ and right hind leg missing.

**Meteorus incompletus.** Type.—Male, yellow label 1283. 2nd Coll. Pub. Mus., Quebec. Poorly pinned. Antennæ broken.

**Meteorus politus.** Type.—Female, yellow label 1266. 2nd Coll. Pub. Mus., Quebec. Badly pinned.

**Meteorus robustus.** Type.—Female, yellow label 1265. 2nd Coll. Pub. Mus., Quebec. Poorly pinned, one antenna beyond middle and hind legs at coxæ, gone.

**Microctonus laticeps.** Type.—Female, yellow label 1286; blue label 616. 2nd Coll. Pub. Mus., Quebec. Right antenna at 4th joint, front legs, right hind leg missing.

**Meteorus vigilax.** Type.—Probably male, yellow label 565. 2nd Coll. Pub. Mus., Quebec. Abdomen gone. Allotype, female without labels.

**Microdus bicolor.** Type.—Female, yellow label 905. 2nd Coll. Pub. Mus., Quebec.

**Microdus dispar.** Type.—Female, yellow label 1256(s). 2nd Coll. Pub. Mus., Quebec. Poorly tag-mounted.

**Microdus nigricoxus.** Type.—Female, blue label 656; yellow label 1572. 2nd Coll. Pub. Mus., Quebec.

**Microdus quebecensis.** Type.—Female, yellow label 581. 2nd Coll. Pub. Mus., Quebec.

**Microgaster auripes.** Type.—Female, blue label 673; yellow label 590. 2nd Coll. Pub. Mus., Quebec. One antenna broken at middle.

**Microgaster brevicaudus.** Type.—Female, yellow label 1167. 2nd Coll. Pub. Mus., Quebec. One antenna broken at tip.

**Microgaster crenulatus.** Type.—Male, yellow label 1577. 2nd Coll. Pub. Mus., Quebec. Left fore leg and left hind leg missing.

**Microgaster lateralis.** Type.—Yellow label 1306. 2nd Coll. Pub. Mus., Quebec. Antennæ, wings on right side and abdomen missing.

**Microgaster melligaster.** Type.—Female, yellow label 1301. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

**Microgaster 4-dentatus.** Male, blue label 45, yellow label 1271. 2nd Coll. Pub. Mus., Quebec.

**Microgaster rubricoxus.** Type.—Male, yellow label 1576. 2nd Coll. Pub. Mus., Quebec. Antennæ and right hind leg broken.

**Micromelus nigricornis.** Type.—Yellow label 942. 2nd Coll. Pub. Mus., Quebec. Fair.

**Mictropis nebulosa.** Type.—Harrington Coll.

**Monedula nigrifrons.** Type.—Female, yellow label 1616. 2nd Coll. Pub. Mus., Quebec.

**Monedula parata.** Type.—Female, yellow label 1617. 2nd Coll. Pub. Mus., Quebec.

**Monobia bicolor.** Type.—Female, white label 61(s); yellow label 1629. 2nd Coll. Pub. Mus., Quebec.

**Monodontomerus viridæneus.** Type.—Not in Pub. Mus., Quebec, unless under *Oligostenus stigma* Fabr.

**Monophadnus pallipes.** Type.—Female, yellow label 1675. 2nd Coll. Pub. Mus., Quebec.

**Mutilla canadensis.** Type.—Not located.

**Myrmica incompleta.** Type.—Not located.

**Nematopodius coxatus.** Type.—Not in Pub. Mus., Quebec, unless under *Cryptus americanus* Cress.

**Nematus decoratus.** Yellow label 1541. 2nd Coll. Pub. Mus. Quebec.

**Nematus fulvicrus.** Type.—Yellow label 485. 2nd Coll. Pub. Mus., Quebec.

**Nematus tetraopsis.** Type.—Yellow label 1673. 2nd Coll. Mus. Parlement, Quebec.

**Neuropenes ovalis.** Type.—See Introduction. (Aphidiinæ.)

**Neuroterus crassitelus.** Type.—White label "Cap Rouge, Canada;" yellow label 934. 2nd Coll. Pub. Mus., Quebec. Bad condition. *Cynips* (*Neuroterus*) *crassitelus*—under *Cynips* in Provancher's catalogue.

**Neuroterus terminalis.** Type.—White label 114; white label 72(s); yellow label 1593. 2nd Coll. Pub. Mus., Quebec.

**Nomia compacta.** Type.—Not in Pub. Mus., Quebec.

**Nototrachis canadensis.** Type.—Female, yellow label 275. 2nd Coll. Pub. Mus., Quebec. Antennæ at scape and front legs missing.

**Nysson nigripes.** Type.—Male, yellow label 1429. 2nd Coll. Pub. Mus., Quebec.

**Odontomerus canadensis.** Type.—Female, yellow label 426. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna. Male, allotype, without labels.

**Odynerus antillarum.** Type.—Not located.

**Odynerus bimaculatus.** Type.—Female, yellow label 1692. 2nd Coll. Pub. Mus., Quebec.

**Odynerus robustus.** Type.—Female, yellow label 1708. 2nd Coll. Pub. Mus., Quebec.

**Odynerus tricolor.** Type.—Male, white label 182, yellow label 1694. 2nd Coll. Pub. Mus., Quebec.

**Odynerus truncatus.** Type.—Male, yellow label 1693. 2nd Coll. Pub. Mus., Quebec.

**Oenone sericea.** Type.—Female. 2nd Coll. Pub. Mus., Quebec. Poorly tag mounted, right antenna broken at tip.

**Oligostenus bimaculatus.** Type.—Harrington Coll.

**Ophion nigrovarius.** Type.—Female, yellow label 273. 2nd Coll. Pub. Mus., Quebec. Antennæ, left hind leg beyond

femora, right hind tarsus in part gone; abdomen broken off but stuck on pin below label. Allotype—Male, yellow label 322. 1st Coll. Pub. Mus., Quebec.

**Opius cinctus.** Type.—See Introduction.

**Opius macrocephalus.** Type.—Not in Pub. Mus., Quebec, unless under under *Alysia rudibunda* Say.

**Opius mellipes.** Type.—n. n. for *O. pallipes* Prov.

**Opius nanus.** Type.—See Introduction.

**Opius niger.** Type.—See Introduction.

**Opius pallipes.** See Introduction.

**Opius ruficeps.** Type.—See Introduction.

**Opius variabilis.** Type.—See Introduction.

**Orgilus detectus.** Type.—Female, blue label 680, yellow label 1573. 2nd Coll. Pub. Mus., Quebec.

**Ormyrus bruneipes.** Type.—Female, yellow label 1358. 2nd Coll. Pub. Mus., Quebec. Fair.

**Orthocentrus abdominalis.** Type.—Female, yellow label 357. 2nd Coll. Pub. Mus. Quebec.

**Orthocentrus albofasciatus.** Type.—Male, yellow label 935. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

**Orthocentrus canadensis.** Type.—Male, yellow label 356. 2nd Coll. Pub. Mus., Quebec.

**Orthocentrus carinatus.** Type.—Male, yellow label 518. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ gone.

**Orthocentrus lucens.** Type.—Not located.

**Orthocentrus nigricoxus.** Type.—Not located. Probably returned to collector.

**Orthocentrus pilifrons.** Type.—Yellow label 355. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ, some legs and abdomen.

**Oxybelus brodiei.** Type.—Female, yellow label 1041. 2nd Coll. Pub. Mus., Quebec. Double mounted and with fly as prey. Apex of right fore wing gone.

**Oxylabis spinosus.** Type.—Blue label 759; yellow label 943. 2nd Coll. Pub. Mus., Quebec.

**Pachyprotasus delta.** Type.—Female, yellow label 496. 2nd Coll. Pub. Mus., Quebec. Right flagellum gone.

**Pammegischia burquei.** Type.—Female, yellow label 507. 2nd Coll. Pub. Mus., Quebec.

**Paniscus albotarsatus.** Type.—Male, yellow label 288. 2nd Coll. Pub. Mus., Quebec.

**Paniscus albovariegatus.** Type.—Male, yellow label 287. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen at apex broken off.

**Paniscus appendiculatus.** Type.—Not in Pub. Mus., Quebec, unless under name, *Paniscus geminatus* Say.

**Paniscus quebecensis.** Type.—Not in Pub. Mus., Quebec, unless under name *Exetastes suaveolens* Walsh

**Pantoclis inermis.** Type.—Yellow label 1119. 2nd Coll. Pub. Mus., Quebec. Fair.

**Paphagus rugosus.** Type.—Yellow label 1383. 2nd Coll. Pub. Mus., Quebec. Badly mounted.

**Paramesius longicornis.** Type.—Yellow label 950. 2nd Coll. Pub. Mus., Quebec. Fair.

**Pelopæus argentipilis.** Type.—Not located.

**Periclistus obliquus.** Type.—White label 156; white label 74(s); yellow label 1594. 2nd Coll. Pub. Mus., Quebec.

**Perilampus aciculatus.** Type.—Blue label 767(s); yellow label 1359. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen gone.

**Perilampus lævis.** Type.—Harrington Coll. Paratype—Yellow label 932. 2nd Coll. Pub. Mus., Quebec. Badly mounted.

**Perilampus stygicus.** Type.—Yellow label 1599. 2nd Coll. Pub. Mus., Quebec. Fair.

**Perilitus incompletus.** See *Meteorus*.

**Perilitus mellinus.** Type.—Female, yellow label 727. 2nd Coll. Pub. Mus., Quebec. Antennæ, median tarsi, right hind leg at coxæ, left hind tarsi broken.

**Perilitus nigritus.** Type.—Male, yellow label 1579. 2nd Coll. Pub. Mus., Quebec. Tag mounted. Right antenna entirely, left beyond middle, left posterior wing, median and hind leg on left and right hind tarsi missing.

**Pezomachus niger.** Type.—Female, white label 34(s); yellow label 1492. 2nd Coll. Pub. Mus., Quebec. Fair.

(To be continued)

## BOOK NOTICES.

PLANT MATERIALS OF DECORATIVE GARDENING—The Woody Plants, by William Trelease, Professor of Botany in the University of Illinois, Urbana. Published by the Author 1917, $1.00 postpaid.

A good entomologist is necessarily more or less of a botanist. If he has not studied botany he is hampered in his work by his inability to name the food plants of his entomological captures. The modern entomology necessitates ecological study. Doctor Trelease has prepared a little handbook under the title given above, which is inexpensive and of a size to readily fit the pocket, and which, nevertheless, includes within its flexible covers more than two hundred pages of condensed information which will apparently make it possible for any careful observer to learn the generic and usually the specific name of any hardy tree, shrub, or woody climber that he is likely to find cultivated in the Eastern United States (not in the extreme South) or in Northern Europe. Of course, on the more pretentious estates, or in nurseries or botanical establishments, introduced forms will be found which are not included in this book; but it indicates 247 genera and 782 species, with some 375 minor forms, or over 1,150 distinct kinds belonging to 83 natural families. The author, in his introduction, states that for a few hopelessly complicated genera, such as the haws, the cotoneasters, mockoranges and roses, only a few of the most easily recognized species have been admitted. Except for these, an effort has been made to include all but the newer species; and, by way of compensation for omissions, the common trees and shrubs of the orchard may be traced to their species, and also the commoner native shrubs and cover plants.

I have not tried to use this book in the field, but I am struck with the choice of easily observed characteristics of differentiation and with the full glossary. It is a book which every field entomologist should possess. L. O. HOWARD.

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A PRELIMINARY LIST OF THE INSECTS OF THE PROVINCE OF QUEBEC, PART III—COLEOPTERA. By G. Chagnon, Montreal. Published as a supplement to Report of the Quebec Society for the Protection of Plants 1917.

It is gratifying to note the good progress made by the entomologists of the Province of Quebec in their arduous task of listing the insect fauna of their Province. With the appearance of the third part, three of the four largest orders have now been covered, and the work is, therefore, more than half-way towards completion.

The list of Coleoptera, numbering 1,810 species and varieties, is compiled from various published lists together with records of captures furnished by a number of collectors, of whom the author contributes a large majority. It is a very creditable list for a region of which but a small part has been explored from the entomological standpoint, and in which but few entomologists have made a specialty of the beetles. As the author remarks, the number of species which occur in the Province will be easily increased by over 500 by more assiduous collecting, particularly in the remoter districts.

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Studies in Kansas Insects.—A Treatise of the More Common Species. Bulletin of the University of Kansas, Biological Series, vol. XVIII, No. 1, October, 1917.

This is a most useful report, which should find its way into every entomological library. It contains the following five articles: "The Grasshoppers of Kansas, Part I, The Melanopli of Kansas," by P. W. Claasen. This is divided into two parts, (1) Systematic, (2) Biologic and Economic. No fewer than 6 genera and 39 species are discussed. Part 2, "The Oedipodinæ of Kansas," by Raymond Beamer; a systematic account of this subfamily, which is richly represented in the State. It is abundantly illustrated, chiefly by photographs of actual specimens. "The Dragonflies of Kansas," by C. H. Kennedy, an annotated list with an analysis of the fauna from the standpoint of distribution, illustrated by 7 excellent plates. "Scale Insects Injurious to Shade and Fruit Trees, The Coccidæ of Kansas," by P. B. Lawson, a valuable descriptive account of the 75 species of this family known to occur in the State. All the species are well figured. "The Cankerworm—An Orchard and Shade Tree Pest," by Walter H. Wellhouse, a very full account of both species of cankerworm, describing their various stages, distribution, life-history, food, enemies, methods of control, etc. It is illustrated by 3 plates.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### A RED-LETTER DAY.

BY FRANCIS J. A. MORRIS, PETERBOROUGH, ONT.

Part I.

On July 2nd, 1917, I formed one of a party of friends who motored up to Chemong Lake. We were celebrating the holiday, but in a peculiar way: half an acre of ground had been rented by the more enterprising members of the party, and on it quite a respectable market garden was in process of culture: how respectable, you will perhaps best understand when I tell you that it yielded during the season several barrels of potato bugs. When Tom Sawyer wanted his fence whitewashed, he simply cracked up the job till his friends insisted on doing the work for him; much in the same way for more than a week—especially in the leisure hours of evening—my neighbour had been carefully preparing the ground for me to dig in with the hoe. But the strategic advantages of his position were more than neutralized by my thorough acquaintance with Tom Sawyer and the famous whitewashing episode. I was well aware that the picnic wasn't going to be all cakes and ale and that I should be expected to do my bit; but just as my neighbour took rod and reel, I took insect net and cyanide bottle, to provide for lucid intervals.

It was about half-past ten when our chauffeur drew up in a spacious cedar thicket almost at the water's edge. We found the occupants of the other car had stopped at the kitchen-garden instead of coming on the last half mile to headquarters. Feeling confident that there were not hoes enough to go round I invited the only other man in our party to come exploring the wood with me; he had spent 60 years diligently ignoring woods, so I knew he was pretty safe to refuse; and indeed I hardly waited to see what "starting-hole" of excuse he would wriggle down, before plunging into the shadowy cedar aisles in a direction calculated to bring me out near a big hill that I had noticed during the drive. This height commanded a view of the lake and was wooded in front all

down the steep slope to the shore; the trees were mixed, but with cedar predominating. On the top of the slope were 3 or 4 magnificent basswoods, a landmark for miles around.

Moving south-westward I soon shook myself clear of the cedar thicket, and crossing a somewhat spongy meadow began to ascend the slope. Half-way up I came upon a small clearing, partly filled in with raspberry bushes and surrounded on all sides by cedars. Hardly had I stepped into this, than a sharp, querulous bark, almost like a fox-terrier's, warned me that I had been discovered by a sentinel crow on its outlook post overhead. Almost immediately bedlam broke loose and the air was thick with these black, jabbering lunatics. For a moment I was puzzled to know why a general alarm had been rung in, but it was soon apparent, nearly every cedar round the edge of this hidden glade had 3 or 4 young crows roosting on its branches, and though at first they tried the dodge of "freezing" on their perch, they soon began hopping and fluttering clumsily into cover, while the old birds guarded their retreat.

Finding nothing of interest about the raspberry thicket or the elder shrubs in its midst, I resumed my climb and presently won out to the top. Here I paused and took my bearings; just beyond me, on the far side of a low bank of field-stone, topped by a rickety old rail fence, lay an open meadow, while over my head stretched the noble canopy of a giant basswood. If my tribe had a totem pole, it should be of either basswood or white pine, for most of my lucky finds have been about these two trees, and I seldom pass either without giving it a good look-over. If my faith had ever wavered, that tree effectually nailed my colors to the mast forever and a day; on the very first leafy branch and almost the first bit of foliage that caught my eye, there sat an unmistakable specimen of *Hoplosia nubila*. Now this beetle is far from common; during all the years of collecting in Port Hope, I had never seen it, and in three seasons at Peterborough I had taken but four, all on freshly fallen timber, three on basswood and one on beech.

There was a breathless moment of suspense while I captured the insect and registered a mental vow not to leave the spot till I had hunted high and low for further trace of its kind. For some minutes my eye ranged over the foliage for insects as searchingly

as an up-to-date spraying machine, but without result. I then drew close to the trunk of the tree, and on the jutting spike of a dead branch appeared another *Hoplosia nubila*. I had seldom found anything of much account on dry wood, but I recalled the book statement that this insect bred in dead limbs of basswood. Half the tree spread out on the meadow side of the low stone rampart, so I made to enter the field; on the upper end of a picket and again on the top rail of the fence I met—apparently, like me, getting over the wall—three more specimens of *Hoplosia nubila*.

Where had they come from? Had they dropped from the green foliage above, or emerged from a dry branch under the tree? I noticed now for the first time a large, dead limb lying along the bank of field stone—a windfall of several years ago—rotting, but fortunately not sodden from contact with the earth; the end away from the butt had one or two boughs still armed with broken branches, and one of these rose at an angle and was partly supported on the second rail of the fence right at the picket. Only an enthusiastic collector knows how my mouth watered and my heart danced when I looked closely at the picket and the branch here on the sunny side of the fence: resting on their surface, within easy reach, I counted 7 specimens of *Hoplosia nubila*. By the time I turned reluctantly away to join the hoeing-bee at lunch, I had captured 17.

As soon as lunch was over some of the men scattered to look for bait, hoping to catch a bass or two before revisiting the kitchen-garden. I, too, set out to look for bait, but as soon as I rounded the corner I dived into the friendly shelter of the cedars and made a bee-line for the basswood. The sun had almost given my recruiting ground the slip, but I succeeded in capturing 8 more specimens about the dead limb and the picket fence; and on visiting some trees further along the ridge I captured 2 more.

To test out the insect's habits and season I made it a point during the next few days to visit all the basswoods newly felled or dead that I could think of in the neighbourhood: on July 3rd I examined some newly felled basswood at Nassau and succeeded in capturing 3 specimens of *Hoplosia*, apparently attracted to the dying trees either to breed or to oviposit on the branches; and a few days later I took 5 on some windfalls and one on a lopped

branch in the same neighbourhood; also on July 4th, revisiting this dead limb of my first captures west of Chemong, I took 4 more specimens, including a mating pair and a single specimen in the very act of emerging, its head and antennæ alone being visible. Examination of the insect's burrow and of others in which I found larvæ, went to prove that it is fondest of dead wood and that it does not bore deep, the tunnels being all either in or just below the under bark. For nearly a fortnight I came across occasional specimens of the beetle, and had the unique experience of making one capture on a dead *maple;* altogether my catch for the season of this rare longicorn was well over 40 specimens. It never rains but it pours.

Part II.

On this holiday of July 2nd, it was still early afternoon when I returned to the picnic ground; learning there that the men, after landing a small sunfish, had been converted from angling-rods to hoes, I hurried off to encumber them with help. When I reached the fence and hailed the toilers, I found that the stony land in a fit of wanton mischief had smashed one of their hoes and—in short they scorned my proffered help and (in much the tone that the Athenians of old consigned a man "to the crows") they bade me be off to my beloved bugs.

"There's many a true word spoken in jest," though that was not the comment I muttered as I turned away in the direction of a fallen poplar by the roadside. It was a balsam or small balm-of-Gilead, and on it I found 2 specimens of *Hyperplatys aspersa*, my first that season. Working east, I then skirted the fence between the road and the market-garden. Almost at the corner of of the half-acre lot I noticed, doing duty for a top rail in the old snake-fence, a dead brush-head of hemlock; branches, twigs, and actually a few cones still in place; quite dry, even to the patches of resin upon it. I examined this closely in hopes of longicorns or buprestids, as the sun poured its burning rays over the surface, and presently on the south side I noticed a curious looking weevil that was strange to me; it was black and rough on the back, with a conspicuous, broad patch of dull, white across the elytra near the base; it reminded me a little, in pattern at least, of a somewhat uncommon beetle called *Eurymycter* which I have occasionally

captured; only the patch on this last is snow-white and situated at the outer end of the elytra.

Before dropping my prisoner into the *oubliette*, I took off my glasses and examined it closely; it was entirely new to me; on the centre of the thorax was a perfect little *fleur-de-lys* or trefoil of fawn-coloured pubescence, while on the scutellum was a tiny spot of white. On getting a front view of the head, I found it had the long, broad, flat "horse-face" of the *Anthribidæ*, and this feature was rendered all the more conspicuous from being white with dense pubescence. I had never ventured very far into even generic distinctions of the great Clan Curculio, and made no attempt when I got home to examine my find under a lens. But meantime I searched carefully over the bark of the hemlock for more, and at last, just when I was giving up the search, I spotted a second specimen (rather larger, but with decidedly shorter antennæ) right on the upper surface of the hemlock. Seeing two or three more hemlocks in the same condition of decay, I spent an hour of unremitting toil scouring their surface, above, below and on the sides, ferreting into every nook and cranny with searching looks; but all in vain.

When I came to pin my captures, I found that the tiny white scutellum had immediately behind it (i. e., further from its base) a spot of jet black pubescence that looked like a cavity, and also that the roughness on the elytra was strongest a little behind the base, where it rose into two bold tubercles (one on each elytron), for all the world like a pair of projecting shoulder blades; and these tubercles were partly within, partly without the white patch mentioned before. After dating the insects and putting them into one of the collecting cases in which I keep the season's catch from spring till fall, I soon forgot all about them in the more fast and furious fun of hunting Long-horns.

During July and August I was corresponding with a well-known New York coleopterist in the matter of *Microclytus gazellula* Hald. and its puzzling little doppelgänger *Microclytus gibbulus* LeC. This correspondence culminated in the arrival of a precious little box at our tent on Cache Lake. It contained a beautiful specimen of *M. gazellula;* in writing to thank for this most acceptable present, I promised the donor a verified pair

(♂ and ♀) of *M. gibbulus* as soon as I returned from camp. A few days after, I received a letter of acknowledgement, with a P. S. which declared that the writer had for years greatly desired to possess in his cabinet a specimen of a small beetle found, but rarely, on fungus-covered logs in our northern forests; it was called *Gonotropis gibbosus*. I had never heard this name before, nor did I know to what family the beetle belonged; so, naturally, my first thought was that I could never have come across the insect or I should have known the name, and further, that among the 10,000 or 11,000 beetles known in North America, it was most improbable I should ever stumble upon the particular one my correspondent desired.

When, moreover, I returned from the backwoods and drew out my Henshaw to find *Gonotropis* a weevil, I felt still more certain it was a case of looking for a needle in a haystack; nor was it much better to learn that it belonged to the small family of *Anthribids*, for of these I had only 2 or 3 representatives at most. However, I turned up the two works I possess on the weevils, LeConte and Horn's monograph and the recent book of Blatchley and Leng; here, avoiding the small print of detailed description, I looked to see the range and record of captures; from the older work I found that the insect was *sui generis* and (worse and worse!) that both generic and specific descriptions were founded on a single specimen from Colorado; the recent work did indeed record it over a very wide range on both sides of the border, but it was evidently extremely rare, for the senior author, Leng, was the very man who had written to me about it.

Having gone so far, however, I glanced over the detailed specific description: "convex, black; white face, proboscis and scutellum; broad, saddle-shaped patch of white near the base of the elytra; two humps on the 3rd interval;" and suddenly there rose out of the page before me the picture of a stony market-garden, two mocking men with hoes, a snake-fence, a dead hemlock rail, and that queer little pair of weevils squatting on the bark, like hobgoblins in a fairy tale. I jumped for the shelf on which my July captures lay cabined, and from the middle of a box most ludicrously labeled "Bachelors," drew out the tiny pair of

oddities (husband and wife, as sure as antennal measurements could make them) captured at Chemong on July 2nd.

I then subjected them to a careful scrutiny with the specific description before me. Point for point, they coincided throughout. The only thing debatable was the "deep fovea" behind the scutellum; if "behind" meant further from the base, there was no cavity there; I focused the insect under a two-inch objective in the microscope, and after some trouble succeeded in touching the centre of this so-called pit with the point of a fine needle mounted on a pen-holder; as soon as the needle point came into focus the insect was jarred into a blur, and when the vibration ceased there was the needle-tip still in focus and resting *on* the centre of the black spot; it was no fovea, but a tiny patch of jet-black pubescence on a level with the snow-white scutellum.

To the best of my belief, then, on July 2nd, 1917, besides capturing over a score of *Hoplosia nubila*, I had taken two specimens of this great rarity *Gonotropis gibbosus*, specimens, moreover, that by a unique stroke of luck formed a natural pair, male and female. If it never rains but it pours, assuredly on this date, in the quaint parlance of Geoffrey Chaucer, it fairly "snewèd" of good things.

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## A TIPULID FLY FROM BALTIC AMBER.

BY T. D. A. COCKERELL AND GRACE E. CLARK, BOULDER, COL.

In *Canad. Entom.*, 1915, p. 159, it was remarked that some of the Mycetophilidæ had remained without evolutionary progress in about a million years, exhibiting merely minor changes or the shuffling of characters, producing closely related species. The Baltic amber is probably twice as old as the Florissant shales, and yet, in spite of the great age of the specimens, dating back to Oligocene times, we find that many of the species differ little from those of to-day. Such, for instance, is the Tipulid fly now described. It presents an assemblage of characters which permit its recognition as a species; but we cannot say that it is more primitive or archaic in appearance than its descendants or representatives living in the same region at the present time.

**Limnophila electrina,** n. sp.

*Male.*—Body and legs dark reddish brown, thorax decidedly

reddened above; head black; tibiæ with minute spurs; antennæ as shown in Fig. 1.

Wings nearly 6 mm. long, without markings; subcosta branched at end, with lower branch a trifle longer than upper, its termination level with basal end of discal cell; radius straight except for a very slight upward bend at the end; radial sector sharply bent near its origin, with an appendicular nervure directed basad from the angle; $R_2$ and $R_3$ both show a gentle and practically even

Fig. 1.—*Limnophila electrina*, n.sp.: antenna.

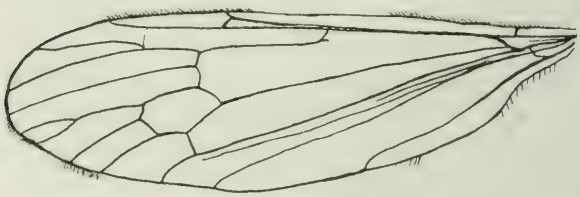

Fig. 2.—*Limnophila electrina*, n.sp.: wing.

curve; upper branch of media forked a considerable distance beyond end of discal cell, the stem a little longer than the fork; radial cross-vein joining radial sector at base of fork of its upper division (as in *L. nacrea* and *lentoides* figured by Alexander, and *L. rogersii* figured by Scudder); posterior cross-vein joining discal cell a little beyond middle; $Cu_2$ sharply deflected downward at its end.

The following measurements are in microns: end of $Sc_2$ to radial cross-vein, 784; upper apical corner of first basal cell to separation of $R_2$ from $R_3$, 496; radial sector from basal angle to end of first basal cell, 1089; discal cell on second basal, 352; discal cell a fifth posterior, 240; first posterior on third, 640; first posterior on second, 592.

In Baltic Amber; received from Mr. F. H. Ward.

This appears to be distinct from all the species described by Meunier from amber. The antennæ have bristles resembling those of *L. vulcana*, but the basal joint is far more robust. The wings appear to be quite distinctive.

# THE INSECT COLLECTIONS OF THE MARITIME PROVINCES.

BY W. H. BRITTAIN, PROVINCIAL ENTOMOLOGIST FOR NOVA SCOTIA.

The following notes on the insect collections of the Maritime Provinces have been compiled from information sent me by the owners or curators of the collections referred to in the article. It has not been possible for the writer personally to examine all the collections, and accordingly he has to acknowledge his indebtedness to the following: Mr. Harry Piers, Curator, Provincial Museum, Halifax, N.S.; Mr. Jos. Perrin, McNab's Island, N.S.; Mr. Wm. Mackintosh, Provincial Entomologist, St. John, N.B.; Mr. L.S. McLaine, Fredericton, N.B., and Mr. A. G. Dustan, Annapolis Royal, N.S. In some cases the exact words of the foregoing have been used in describing the collections.

INSECT COLLECTION OF THE PROVINCIAL MUSEUM, HALIFAX, N.S.

The insect collection of the Provincial Museum of Nova Scotia consists of about 2,000 Nova Scotia specimens, most of which have been collected since 1900. It consists almost entirely of Lepidoptera, with a few Coleoptera, some Orthoptera and other miscellaneous insects. The principal components are:

1. The Russell Colection of Lepidoptera, consisting of about 259 specimens of butterflies and about 788 specimens of moths, total about 1,047 specimens, each with full data attached, and collected by John Russell in the vicinity of Digby, Nova Scotia. It was purchased from him in 1906 and 1909. This is part of the material upon which Messrs. Joseph Perrin and John Russell prepared their "Catalogue of Butterflies and Moths, mostly collected in the neighbourhood of Halifax and Digby, N.S.," which was published in the Proc. and Trans. N. S. Institute of Science, Vol. 12, pp. 258–290 (read 1909, published 1912).

2. The Eaton collection of Lepidoptera, with a few other insects, consisting of about 450 specimens, with data collected during a number of years by Miss Lucy C. Eaton, in the vicinity of Truro, Col. Co., N.S. Of these 379 were purchased from her in 1905 and the remainder under her donations. The Lepidoptera in this collection formed the basis of her paper on "The Butterflies of Truro, N.S.," which was published in the Proc. and Trans. N. S. Institute of Science, Vol. 9, pp. 17–18 (1895).

3. Miscellaneous specimens of Nova Scotia Coleoptera collected by A. H. C. Prichard, specimens of Orthoptera and other Nova Scotia insects from various sources.

Owing to the lack of proper insect cabinets for the preservation and display of all these specimens, they are at present stored in boxes and somewhat liable to attack by pests, but it is the intention of the institution to obtain proper cabinets for them as soon as possible.

Insect Collection of the Nova Scotia Agricultural College.

The great bulk of the material composing the collection of the Nova Scotia Agricultural College consists of specimens taken in the province by members of the entomological staff from the summer of 1913 up to the present time, together with a few insects captured in other provinces. There is also a small collection of Coleoptera taken in Kansas a good many years ago, as well as a certain amount of material received in exchange from various American entomologists.

All doubtful specimens have been submitted to specialists for determination. The Coleoptera have been determined by Professor Wickham and Dr. Van Dyke; the Lepidoptera, by Mr. Arthur Gibson; the Hemiptera by Messrs. E. P. Van Duzee, H. H. Knight and H. S. Parshley and the bees by Mr. Sladen. Dr. L. O. Howard and the members of his staff have from time to time reported upon a large number of insects of different groups.

The following account does not take into consideration a large number of insects that have been determined but not put away in the collection. There is also some accumulation of material that has not yet been put up ready for determination, and still more that we have not been able to get determined at all. The latter particularly applies to Diptera and to parasitic Hymenoptera.

In the Coleoptera we have about 1,000 specimens distributed over 38 families and 203 genera; in the Lepidoptera about 1,000 specimens, 25 families and 300 genera; Hemiptera about 800 specimens, 23 families and 115 genera; Hymenoptera 340 specimens, 10 families and 19 genera; Orthoptera, 164 specimens, 3 families and 13 genera. There are about 110 named species of Diptera, but the greater part of the material in this order is still

undetermined. The material in groups other than those mentioned is insignificant.

A complete card index is kept of all insects in the collection, with full details regarding each species. In this way it is intended to build up an authentic list of Nova Scotian insects as rapidly as this can be accomplished. The Lepidoptera are put up in Comstock cases with the bottoms lined with patent cord instead of wooden blocks. All other orders are placed in Schmitt boxes. After a representative number are placed in the regular collection, the remainder are placed in duplicate boxes to be used in exchange.

### Other Insect Collections in Nova Scotia.

Mr. Jos. Perrin, McNab's Island, Halifax, N. S., has a private collection of Lepidoptera, mostly taken on McNab's Island. He also has twelve cases of American and foreign Lepidoptera. The collection is housed in an oak cabinet with thirty drawers and containing material collected for the Russell-Perrin List published February, 1912, and for the supplementary list published October, 1915. The number of specimens contained in the collection is 1,470, representing 286 genera and 122 species and varieties.

Mr. Perrin also has in his care at present eight Riker specimen mounts, containing 387 specimens of Lepidoptera taken at Stellarton, N. S., by Mr. C. B. Hills, of Wabana, Newfoundland. Many of these are of interest and are not yet identified.

Mr. Chesley Allen, Normal College, Truro, N.S., has collected in all orders but, with the exception of the Lepidoptera, most of the material has not yet been arranged, though work on this is now proceeding. Mr. Allen is especially interested in the Microlepidoptera and has a complete collection of Nova Scotian Crambinæ, including a number not recorded in the list. He is now preparing an article on this group.

Mr. Harry Piers, Curator, Provincial Museum, Halifax, N.S., has a private collection of insects, consisting mostly of Orthoptera, on which is based a paper dealing with this group, which he will shortly publish.

The collection of the Dominion Entomological Laboratory at Annapolis Royal consists of nearly 3,000 specimens, most of these belonging to the Lepidoptera and Hymenoptera, but the other main orders are represented to some extent. Much of the material is still undetermined.

## Collection of Insects in the Natural History Museum at St. John, N. B.

The Natural History Society of New Brunswick was organized in 1862. The majority of the members at that time were geologists and ornithologists, and it was not until about 1884 that the first collection of the insects of St. John County was presented by Mr. H. E. Goold. Mr. Goold may be considered the pioneer entomologist of the Natural History Society of New Brunswick. A few years later Mrs. C. E. Heustis made a collection of insects in the vicinity of St. John and presented it to the Museum. For a number of years Mrs. Heustis was a contributor to the Canadian Entomologist. These collections were exposed to light and insects were almost entirely destroyed.

About 1895 Wm. McIntosh began making a general collection of the insects of New Brunswick. This collection has steadily grown, and at the present time numbers about nineteen thousand four hundred and sixty-seven specimens. Mr. A. G. Leavitt collected Hymenoptera for several years and recently presented his collection, numbering about two thousand specimens, to the Museum. Smaller collections have been presented from time to time.

At the time of writing the insect collections in the Museum number over 24,000 specimens, including several thousand specimens, which have not yet been incorporated in the general collection and a large number of unnamed "unique" specimens. As is the case in so many collections, the Lepidoptera outnumber the other orders. The general collection shows some five thousand one hundred and seventy specimens representing less than eight hundred species.

The New Brunswick material was determined mostly by Dr. Fletcher and Herman Strecker. The Noctuidæ were named by Dr. John B. Smith and Dr. Ottolengui: Geometers by Rev. G. W. Taylor, of British Columbia, and others by Dr. H. C. Dyar and Wm. Beutenmuller. The Hymenoptera, numbering some four thousand eight hundred and thirteen are not well worked up. Mr. Sladen determined a number of the bees, and Mr. H. H. Harrington many of the saw-flies, etc. S. A. Rohwer, of the United States National Museum, determined a number of the saw-flies, finding

twelve new species among them. Some hundreds of species remain undetermined. The Coleoptera were examined first by Mr. Harrington and later by Dr. Wickham. They include about six hundred named species and a considerable number undetermined, about four thousand one hundred and eighty-seven in all. The Diptera number about four hundred species, three thousand three hundred and sixty-five specimens, many unnamed not being enumerated. The other orders are not very well represented in the collection—Hemiptera about four hundred and forty-two specimens; Dragonflies, two hundred and thirty-one; Orthoptera, one hundred and twenty-nine. Stone-flies and their allies two hundred and seventy-six; other orders about four hundred and fifty-four.

It has always been the policy of the Natural History Society of New Brunswick to make its collections useful to the public, and with this end in view nearly two hundred large Denton tablets have been prepared showing the various insect orders, with life-histories of the important economic pests, useful insects, etc. These tablets have been around the province twice on "Better Farming Special" trains, and have been exhibited at a number of Agricultural Exhibitions. They are used in the Agricultural and Natural Study Short Courses for teachers in winter and summer, and are loaned to schools when available. Indeed, so much material has been given to schools and farmers and used for educational exhibits as to seriously deplete the general collection.

### Other New Brunswick Collections.

A good many years ago the Provincial University at Fredericton purchased the Preston collection. These were collected by Dr. Preston, a homeopathic physician at St. John, and consisting of a cabinet of eight or ten trays. Four of these were Coleoptera, native and exotic forms herein represented. They are partially named. There are also two cases of Lepidoptera, native and exotic, partially named, and one case of Odonata. The collection is in poor condition at the present time, and evidently has not been touched for years. The University also has six trays of native insects, mostly Lepidoptera. A few of these have been named by Dr. L. W. Bailey and William McIntosh. They are not in very good condition.

The Dominion Entomological Laboratory at Fredericton has a collection of Diptera in which the New Brunswick forms are well represented, especially the following families: Tachinidæ, Tipulidæ, Tabanidæ, Syrphidæ, Dolichopodidæ, Muscidæ, Asilidæ and Anthomyiidæ. There is a small collection of parasitic Hymenoptera and one of Formicidæ fairly representative of the province. There are also a few Lepidoptera.

The foregoing are a few of the chief insect collections found in the Maritime Provinces. We have heard of others, but have been unable to secure accurate information concerning them. Doubtless still others are in existence, and it is hoped that this article may have the effect of bringing them to light. Up to the present time we have been unable to get word of a single systematic collection of insects in the Province of Prince Edward Island.

## A NEW SPECIES OF SARCOPHAGA FROM BRITISH COLUMBIA.*

BY R. R. PARKER, BOZEMAN, MONT.

**Sarcophaga vancouverensis,** n. sp.

*Holotype.*—Male, collection of R. R. Parker.

*Allotype.*—Female, collection of R. R. Parker.

*Paratype.*—Male, United States National Museum.

*Length* 8 to 10 mm.

Male.—Head. Viewed from side parafrontals and genæ with dark reflections; from front transverse impression unusually dark. Breadth of front at narrowest part about one-third eye width; cheek height approximately one-third that of eye. Front prominent; frontal vitta at its narrowest part about three times width of each parafrontal. Second and third antennal segments very dark; third, one and one-half times length of second; arista short plumose to slightly beyond middle. Back of head with the black cilia behind eyes extending half-way to foramen, otherwise clothed with whitish hair. Gena with several irregularly placed hairs between transverse impression and lower eye orbit.

*Chaetotaxy.*—Lateral verticals absent; vibrissæ inserted slightly above oral margin; frontal rows of bristles extending but slightly

*Contribution from the Entomological Laboratory of the Montana State College, Bozeman, Mont.

April, 1918

below base of vitta, the lower few pairs somewhat divergent from its edges.

Thorax.—Metanotum clothed with sparse, slender, reclinate bristles. Spiracular hairs very dark, except those of spiracular cover which are light coloured at tips. Epaulets dark.

Wings.—Distinctly smoky under binocular; bend of fourth vein normally a right angle, anterior cross-vein scarcely more basal than end of first longitudinal (almost beneath it); third vein bristly; costal spine vestigial; section III of costa slightly greater than section V; calypters whitish, fringed with white hair.

Legs.—Dark. Posterior femur sub-cylindrical, a little arched; distal half of posterior ventral surface with a thin beard of long hair; anterior face with three rows of bristles, those of intermediate row few and not present distally, those of lower row scattered; tibia with anterior and posterior beards of long, coarse hairs, the former much the stronger. Middle femur clothed beneath with short hair; anterior and posterior ventral rows of bristles present, latter not complete proximally; distinct "comb" absent; tibia with a slight beard-like fringe of hair posteriorly; submesotibial bristle present.

*Chaetotaxy*.—Anterior dorsocentrals long, as long as the two anterior pairs of postsuturals; acrostichals absent; inner presuturals scarcely or not at all differentiated: three pairs of well developed postsutural dorsocentrals; praescutellar acrostichals present; scutellar apicals present: two or three sternopleurals, if three the middle one is very slender: lower sternopleurals slender, with hairs anterior to them.

Abdomen.—Clothed above with short, reclinate bristles, beneath with longer, mostly erect hairs. Ventral plates almost square (posterior angles not rounded), vestiture erect except that of third which is short and decumbent.

*Chaetotaxy*.—Second segment without marginal bristles; third with two marginals and four or five laterals (marginals and laterals may not to be separated by increased spacing, so that there may appear to be a complete marginal row of bristles).

Genital Segments.—First, shining black or deep brown, in profile slightly convex, for most part the hairy vestiture shorter than that of second, marginal bristles absent; second (g. s. 2),—

shining orange, anal area small, hairy vestiture long. Forceps (f.),—darkened, especially the distal portion, in profile the hairy vestiture extends well toward tip of prongs, later attenuate, curved forward and slightly spreading.

Genitalia.—See figure. Anterior claspers (a. c.), posterior claspers (p. c.), accessory plate (a. p.).

Fig. 3. — *Sarcophaga vancouverensis*, n. sp.: genitalia of male.

Female.—The single female examined differs from the male in the following important characters: breadth of front at narrowest part nearly equal to eye width; frontal vitta at its narrowest part about one and one-half times the width of each parafrontal, and just below ocellar triangle with several hairs at each side. Arista more plumose. Posterior femur spindle-shaped, its posterior ventral surface with a proximal row of bristles. Anterior and posterior rows of ventral bristles of middle femur complete. Costal spine short. Three sternopleural bristles. Vestiture of abdomen of short reclinate bristles throughout. Genital segments dull orange: first not divided into two lateral lips, but carinated on mid-dorsal line (appears like two lips), spiracles central and visible. Ventral plates overlapped and concealed by lateral edges of first genital segment.

Described from 7 male and 1 female specimens.

Range.—British Columbia, Vancouver, May 12 and 19, 1916, June 11, 1916; Savary Island, July 3, 1916. One specimen is labeled "Bd. Bay, May 22, 1915." Collector, R. S. Sherman.

Both holotype and allotype were collected on Savary Island on July 3, 1916.

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We regret that the statement in our March issue concerning Professor W. A. Riley's change of position was inaccurate. A corrected statement is given below.

Professor Wm. A. Riley, who has been connected with the Entomological Department of Cornell University for the past eighteen years, has been appointed Professor of Entomology and Chief of the Division of Entomology and Economic Zoology at the University of Minnesota. He will continue his teaching work in Insect Morphology and in Medical Entomology.

# AN APPARENTLY NEW SPECIES OF LEPTINILLUS. (COLEOPTERA, LEPTINIDÆ.)

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

The coleopterous family Leptinidæ includes but two genera and two species, but it is of especial interest because of the fact that these two species are exactly half of the number of species of Coleoptera that are known to be, or suspected of being, ectoparasites upon birds and mammals. Of the other two species one, *Platypsyllus castoris* Ritsema (the only representative of the family Platypsyllidæ) is a permanent, obligate parasite upon beavers in both its larval and adult condition. The other, a Silphid, *Lyrosoma opaca* Mann, is a resident of the nests of certain maritime birds but is suspected of utilizing the birds for purposes of transportation. Of the two Leptinids one, *Leptinus testaceus* Müll. is an oft-recorded resident of the nests of bumble bees and small mammals, but it has once been recorded as occurring on mice[1] and once from shrews[2]. The other, *Leptinillus validus* (Horn), is apparently a much less common form and of its habits nothing is known, except that it has once been taken from the skins of Alaskan beavers[1]. The discovery of a second species of *Leptinillus* with some definite information in regard to its habits is, therefore, of considerable interest.

**Leptinillus aplodontiæ,** n. sp.

*Female.*—Length 3 mm., depressed and broadly oval in shape, of a reddish brown colour, feebly shiny, the entire dorsum closely and uniformly beset with fine, setiferous punctations, the setæ short and slightly lighter in colour than the body. *Head* hemihexagonal in shape behind the frontal suture, the labrum convex anteriorly, the posterior angles of the head nearly right angles, the occiput much constricted and produced into the prothorax. Beneath the lateral margin at each posterior angle is a shallow, longitudinal groove which extends forward to the base of the antennæ and into which the first antennal segment may be received. *Antennæ* 11-segmented, slender, reaching but little beyond the posterior margin of the pronotum. *Mentum* with the posterior angles produced into a stout process about as long as

1. Riley, C. V. Insect Life, 1 : 306. (1889).
2. Kellogg, V. L. Science, N. S., XXXIX : 360–61. (1914).

the mentum itself. *Pronotum* anteriorly of the same width as the head, posteriorly about twice as wide, the greatest width about one and one-half times the length, the lateral margins arcuate.

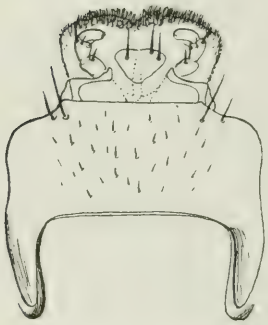

Fig. 4.—*Leptinillus aplodontiæ* n. sp.; labium.

Fig. 5—*Leptinillus aplodontiæ* n. sp.; genitalia of male.

*Prosternum* extending over, but not separating, the anterior coxæ, without a brush of hairs at the tip. *Elytra* at the base very slightly narrower than the pronotum, then widening slightly, sharply

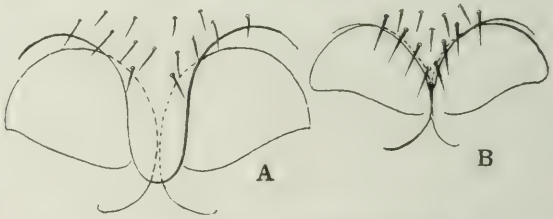


Fig. 6.—A: Prosternum of *Leptinillus aplodontiæ* n. sp.
B: Prosternum of *Leptinus testaceus* Mull. from a specimen from Forrester Id., Alaska, det. Van. Dyke.

rounded posteriorly, entirely concealing the abdomen. *Wings* lacking. Legs clothed with fine pubescence. *Abdomen* ventrally with fine, setiferous punctures.

*Male.*—Length 3.5 mm., elytra not concealing the tip of the abdomen. Otherwise resembling the female. Genitalia very closely resembling the genitalia of *Leptinus testaceus* Müll., as figured by Sharp and Muir[3].

*Habitat.*—From *Aplodontia* sp. (a genus of rodents peculiar to the Pacific Coast), Fallen Leaf Lake, Plumas Co., Calif., Aug., 1917. W. K. Fisher col.

*Types.*—Holotype, a female, and allotype, and thirteen paratypes, one dissected, mounted on slides and used as the basis of the accompanying figures, deposited in the collection of the Department of Entomology of Stanford University.

*Remarks.*—While this species is obviously very similar to *L. validus* (Horn) there are certain differences that are apparent upon a comparison with his original description[4] and later notes[5]. *L. validus* is described and figured as possessing a distinct brush of stiff hairs at the tip of the prosternum, a feature that is not present in the new species, and it is also indicated that the prolongations of the posterior angles of the mentum are very long and slender, while in my specimens they are short and stout as in *Leptinus testaceus* Müll. Nor do my specimens possess any trace of the eye spot described by Horn. Certain apparent differences in shape might easily disappear upon a direct comparison of specimens but there is a real difference in size, the new species measuring but 3 mm. in length for the female and 3.5 for the male as compared with 5 mm. for *validus*. Certainly as far as the literature is concerned there is sufficient ground for recognizing the specimens from *Aplodontia* as distinct.

It should be noted that although the prosternum extends back over the anterior coxæ it does not actually separate them, and they are in fact fully as contiguous as they are in *Leptinus testaceus* Müll.

Mr. Fisher informs me that the specimens were found upon two individuals of the host, and that they leave the host, after it

3. Sharp, D. and Muir, F. Trans. Ent. Soc. London, p. 506; pl. LI, f. 55–55a. (1912).
4. Horn, G. H. Trans. Amer. Ent. Soc., 4 : 145–6; figs. (1872).
5. Horn, G. H. Trans. Amer. Ent. Soc., 10 : 113–4; pl. 5, f. 1–6. (1882).

is killed, as soon as the body begins to cool. I have myself previously examined numerous specimens of the same genus of mammals in a search for ectoparasites but without result, but as all my specimens were examined some time after death it is possible that the beetles had already departed and that they may occur much more frequently than the lack of collecting records would indicate.

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## STUDIES OF CANADIAN SPIDERS IN SUMMER OF 1917.

BY J. H. EMERTON, BOSTON, MASS.

In the past summer I have continued the collection of Canadian spiders north and west of the region covered in 1915 and 1916, in the great bog country south and west of Hudson Bay, which has now been made accessible by the Grand Trunk Transcontinental line and the Hudson Bay railways. Starting in the latter part of June it seemed best to visit the most northern points first, and so in company with Mr. J. B. Wallis, of Winnipeg, I arrived at The Pas, June 30, and took the next train down the Hudson Bay Railway on July 4. The country all the way is nearly flat, descending from about 800 feet at The Pas to 350 feet at Kettle Rapids, 330 miles distant, and the present end of the road. It is covered with a thick layer of sphagnum moss in which grows a forest of small spruce with undergrowth of Labrador Tea and Mountain Cranberry. The drainage is naturally slow, and large and small lakes cover much of the country, connected by streams through which the summer travel of the country is carried on. After a few days at The Pas our next stop was at the railroad camp at mile 214, where we spent nearly a week, then at mile 256 where there is a large area of gravel rising to twenty feet above the general level and then to Kettle Rapids, where we collected for a week in the neighbouring bog and on the river banks. The spiders are for the most part, those which have been long known in the bogs of Maine and Labrador, the tops of the White Mountains or the Rocky Mountains. The most conspicuous species are the three cobweb spiders of the spruce trees, *Theridion zelotypum*, *Linyphia limitanea* and *Linyphia nearctia*. *T. zelotypum* covers the whole area from Kettle Rapids on the north to Minoki and Cochrane

on the south. *Linyphia limitanea* is also found through the whole area except the most southern stations. It is most abundant on trees growing near lakes and rivers. *Linyphia nearctica* appeared only at Kettle Rapids, the most northern station. It had previously been found at Nipigon, Montfort and Lake St. John and onthe coast of Maine and Labrador. For its eastern distribution see the Canadian Entomologist for January, 1917. With these species occurred usually *Lophocarenum decemoculatum*, *Grammonota pictilis* and occasionally *Dipena nigra* and *Tilla montana*, and in the southern part of the range *Theridion montanum*. Among the spiders without webs the most common was *Dendryphantes flavipedes* and in the southern part *Dendryphantes militaris* and *D. aestivalis*. The rarer *D. montanus* of the White Mountains occurred at Kettle Rapids, and with it *Sittacus rainieri* of the Rocky Mountains. Half-way along the railroad were found the rare *Habrocestum (Euophrys) cruciata* of the White Mountains, and also rare *Epeira aculeata* of Laggan and Jasper. The Lycosidæ were of species already known to extend across the continent. As usual where the ground is covered with sphagnum but few spiders were found in it, but in the southern part of the region where the land is higher and drainage better other mosses and leaf mold accumulate and the usual transcontinental spiders occur. *Pedanostethus fuscus*, *Tmeticus montanus*, *Hahnia agilis*, *Bathyphantes subalpina* and *Amaurobius borealis*. At Minaki a new *Lophocarenum* was found, closely resembling *L. sculptum* of the west coast and *L. excavatum* of the east coast. In the bog at Minaki was the black and white variety of *Epeira labyrinthea* with nests hung in the stiff grass near the ground as in bogs of Maine and New York.

Outside of the spruce forest area a little collecting was done at Dauphin and Winnipeg, and around the home of Mr. Criddle at Aweme. At the latter place two species of burrowing spiders, *Lycosa missouriensis* and *Lycosa wrightii* were found in great numbers in the sandy fields, as they are around Chicago and along the Great Lakes. At Dauphin and around the ponds at Cochrane occurred *Singa campestris* a species living in tall grass and before found at Kenora and Edmonton.

# A PARTIAL KEY TO SPECIES OF THE GENUS AGROMYZA (DIPTERA.)

## Second Paper.

BY J. R. MALLOCH, URBANA, ILL.

The species included in the present key are distinguished from their congeners by having the costa discontinued at or slightly beyond the apex of the third vein, and the halteres yellowish or whitish.

The larval habits of very few of the species are known and their known distribution indicates, not their actual range of occurrence but, rather, the fact that very little attention has been paid to the group by collectors. The same fact is in evidence throughout the genus.

This group contains species placed by other authors in *Napomyza* Haliday, and *Domomyza rondani*. Melander records the European species *anomala* Strobl. from Idaho and Washington. I have not seen this species.

1. Frons lemon-yellow; cross-veins very close together.....2
   Frons red or black.....4
2. Lateral margins of mesonotum broadly pale yellow; anterior 2 pairs of dorso-centrals much weaker than the posterior 2 pairs, the front pair much cephalad of suture. Food-plant unknown. Montana; Idaho.....(*brevicostalis* Malloch) *plagiata* Melander.

   Lateral margins of mesonotum not yellow, coloured as disc....3
3. Antennæ black; length of costa from humeral vein to apex of first two-fifths as long as next section; third vein ending little more than length of preceding section of costa before apex of wing. Larvæ mining in *Ranunculus abortivus*. Ind.; Ill.....*davisi* Walton.

   Antennæ black; length of costa from humeral vein to apex of first over three-fourths as long as next section; third vein ending over twice as far as length of preceding section of costa from apex of wing. Larvæ mining in *Verbena*, *Centaurea*, etc., Col.; Ariz.; Alaska; Europe..... *lateralis* Fallen

Antennæ yellow. Food-plant unknown.
Ill. ..... *aristata* Malloch.

4. Frons black ..... 5
Frons reddish ..... 10

5. Last section of fifth vein much longer than preceding section ..... 6
Last section of fifth vein shorter than or subequal to preceding section ..... 7

6. Last section of fifth vein about 2½ times as long as preceding section. Food-plant unknown. Ill. ..... *indecora*, n. sp.
Last section of fifth vein less than twice as long as preceding section. Larvæ mining cambium of *Prunus domestica*. N. Y. ..... *pruni* Grossenbacher.

7. Squamæ gray, fringes brown; last section of fifth vein nearly as long as preceding section. Food-plant unknown. N. H.; Europe ..... *subnigripes* Malloch.
Squamæ whitish, fringes pale; last section of fifth vein slightly more than half as long as preceding section ..... 8

8. Pubescence on arista indistinct; occiput projecting on upper half; mesonotum with 4 pairs of dorso-centrals; cross-veins separated by about the length of outer cross-vein. Food-plant unknown. Ill. ..... *aprilina* Malloch.
Species without the above combination of characters; cross-veins separated by about twice the length of outer cross-vein ..... 9

9. Pubescence on arista indistinct; occiput not projecting; mesonotum with 3 pairs of dorso-centrals. Food-plant unknown. N. M. ..... *abbreviata* Malloch.
Pubescence on arista distinct; occiput projecting on upper half; mesonotum with 4 pairs of dorso-centrals. Food-plant unknown. Alaska ..... *kincaidi* Malloch.

10. Mesonotum with 2 pairs of dorso-centrals; humeri yellow; general colour glossy black; small, robust species, 1.5–2 mm. in length. Food-plant unknown.
Md.; Ill. ..... *nitida* Malloch.
Mesonotum with 4 pairs of dorso-centrals ..... 11

11. Large, robust species, 4 mm. in length; general colour shining black. Larvæ mining cambium of *Prunus domestica*. N. Y.....*pruni* Grossenbacher.
Smaller, slender species, 2 mm. in length; general colour black, slightly shining. Food-plants unknown.
Alaska.....*parvicella* coquillett.

**Agromyza indecora,** sp. n.

*Male and Female.*—Black, shining. Frons opaque, orbits and ocellar triangle shining. Legs black. Wings clear, veins black. Halteres brown, knobs whitish yellow. Squamæ grayish, fringes blackish.

Orbital bristles strong, usually 6 in number; antennæ of moderate size, third joint rounded apically; arista swollen at base, microscopically pubescent; cheek narrow, its height about half as great as width of third antennal joint. Mesonotum with numerous short discal setulæ and 4 strong dorso-centrals; the pair of bristles between posterior dorso-centrals well developed. Abdomen stout. Legs stout, the pair of posterior bristles on mid-tibia very unequal in size. Costa ending just beyond apex of third vein; third and fourth veins very noticeably divergent apically; inner cross-vein usually at middle of discal cell or slightly beyond that point; outer cross-vein below apex of first vein; last section of fifth vein 2 to 2½ times as long as preceding section.

Length 2.5–3.5 mm.

Type locality, White Heath, Ill., June 24, 1916; June 29, 1917; (J. R. Malloch). Food-plant unknown.

This species is closely related to *pruni* Grossenbacher, but may be separated from it by the venation. This character is usually a rather unstable one, but my series of *pruni* contains no example with the last section of the fifth vein approximating to twice the length of the preceding section, while in the large series of *indecora* there is no specimen which has the last section of that vein less than twice as long as the preceding section. The inner cross-vein in *indecora* is usually but little beyond the middle of the discal cell, whereas in *pruni* it is generally one-third from apex of the cell. The third and fourth veins in *pruni* are but little divergent apically; in *indecora* they are strongly divergent.

# LECTOTYPES OF THE SPECIES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from page 106.)

**Pezomachus quebecensis.** Type.—Not in Pub. Mus., Quebec, unless under *Pezomachus canadensis* Cress.

**Pezomachus sulcatus.** Type.—Not located. Probably in Harrington collection.

**Phænocarpa rubriceps.** Type.—Male, yellow label 1052. 2nd Coll. Pub. Mus., Quebec.

**Phæogenes annulatipes.** Type.—Harrington Coll.

**Phæogenes aterrimus.** Type.—Female, yellow label 435. 2nd Coll. Pub. Mus., Quebec. Left antenna at apex and left hind tarsus broken.

**Phæogenes crassitelus.** Type.—Female, yellow label 1196. 2nd Coll. Pub. Mus., Quebec. Ovipositor and sheath broken off at apex of abdomen.

**Phæogenes falardeaui.** Type.—Female, yellow label 666. 2nd Coll. Pub. Mus., Quebec. Allotype without labels.

**Phæogenes gaspesianus.** Type.—Female, yellow label 664. 2nd Coll. Pub. Mus., Quebec. Right antenna broken at 5th joint.

**Phæogenes huarti.** Type.—Female, yellow label 328. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen.

**Phæogenes indistinctus.** Type.—Male, Harrington Coll. Pink label "P. 409." Lacks apex of left antenna. Labeled by Davis = "Phygadeuon."

**Phæogenes mellinus.** Type.—Female, yellow label 719. 2nd Coll. Pub. Mus., Quebec. Some verdigris.

**Phæogenes nigricornis.** Type.—Male, yellow label 988. 2nd Coll. Pub. Mus., Quebec.

**Phæogenes orbus.** Type.—Male, yellow label 514. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

**Phæogenes pinguis.** Type. — Female, Harrington Coll. Head missing.

**Phæogenes recticaudus.** Type. — Female, yellow label 1197. 2nd Coll. Pub. Mus., Quebec. Abdomen broken off and glued on label.

**Phæogenes recticornis.** Type.—Female, yellow label 1200, blue label 15. 2nd Coll. Pub. Mus., Quebec. Right antenna at apex, right fore wing, hind wings, legs on left side, missing; abdomen broken off and glued on label.

**Phæogenes sectus.** Type.—Male, white label 439; yellow label 1552. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna and left hind leg. On short pin.

**Phæogenes tuberculifer.** Type.—Male (?), yellow label 979. 2nd Coll. Pub. Mus., Quebec.

**Phanerotoma fasciata.** Type.—Yellow label 599. 2nd Coll. Pub. Mus., Quebec. Abdomen and antennæ beyond third joint missing.

**Phasgonophora elegans.** Type. — Harrington collection. Paratype.—Blue label 73(s); yellow label 1341. 2nd Coll. Pub. Mus., Quebec.

**Philanthus harringtoni.** Type.—Not located. Probably returned to collector.

**Photopsis canadensis.** Type.—Blue label 690; yellow label 1400. 2nd Coll. Pub. Mus , Quebec.

**Phygadeuon abdominalis.** Type.—Female, yellow label 218. 2nd Coll. Pub. Mus., Quebec. Some verdigris. Allotype.—Yellow label 271. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon acaudus.** Type.—Female, yellow label 1017. 2nd Coll. Pub. Mus., Quebec. Complete but pin obliterates some of the characters.

**Phygadeuon aciculatus.** Type.—Male, yellow label 665. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon albicoxus.** Type.—Male, yellow label 269. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon alternans.** Type.—Yellow label 669. 2nd Coll. Pub. Mus., Quebec. Only thorax and coxæ present.

**Phygadeuon annulatus.** (Name preoccupied.) See *Phygadeuon fusiformis.*

**Phygadeuon apicatus.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon velox* Cress.

**Phygadeuon ater.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon helvipes* Cress.

**Phygadeuon attenuatus.** Type.—Female, yellow label 1048. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon autumnalis.** Type.—Yellow label 640. 2nd Coll. Pub. Mus., Quebec. Thorax and part of legs on pin, rest missing.

**Phygadeuon brevicaudus.** Type.—Female, yellow label 1181. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon capitalis.** Type.—Male, Harrington Coll. Pink label "P. 413."

**Phygadeuon caudatus.** Type.—Female, yellow label 265. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon cephalicus.** Type.—Male, yellow label 663. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon constrictus.** Type.—Yellow label 718. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen and tarsi.

**Phygadeuon cornutus.** Type.—Female, yellow label 938. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon crassipes.** Type.—Female, yellow label 276. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon cressoni.** Type.—Not in Pub. Mus., Quebec. unless under *Ichneumon velox* Cress.

**Phygadeuon curticrus.** Type.—Female, yellow label 1558. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon dorsalis.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon humilis* Prov.

**Phygadeuon dubius.** Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon pubescens* Prov.

**Phygadeuon electus.** Type.—Male, white label 1; yellow label 1117. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ. Provancher mistook sex.

**Phygadeuon excavatus.** Type.—Not located.

**Phygadeuon fasciatus.** Type.—In Pub. Mus., Quebec, with name label. Other data not obtained.

**Phygadeuon fraterculus.** Type.—Female, Harrington Coll. Pink label "P. 404." Lacks left hind leg below coxa and right hind tibia and tarsi.

**Phygadeuon fusiformis.** Type.—Female, Harrington Coll. Pink label "P. 391." Lacks left flagellum.

**Phygadeuon goddessii.** Type.—Not located. Probably returned to collector.

**Phygadeuon gracilicornis.** Type. — Female, Harrington Coll. Left antenna broken.

**Phygadeuon guignardi.** Type.—Female, yellow label 1178. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon hilaris.** Type.—Not in Pub. Mus., Quebec, unless under *Phœogenes helvus*. Cress.

**Phygadeuon impressus.** (Nat. Can. Vol. 7, p. 212) Type.—Male, yellow label 213. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon impressus**. (Nat. Can. Vol. 6, p. 281) Type. —Not in Coll. unless under name *Platylabus thoracicus* Cress.

**Phygadeuon inflatus.** Type.—Not located. Female, yellow label 221 bearing this name label in 2nd Coll. Pub. Mus., Quebec, cannot be type.

**Phygadeuon inhabilis.** Type.—Female, yellow label 205. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon insignis.** Type.—Not in Pub. Mus., Quebec. unless under *Phœogenes herbus* Cress.

**Phygadeuon jocosus.** Type.—Female, old rose label 90. yellow label 1180. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon lavoiei.** Type.—Female, yellow label 660. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon lechevallieri.** Type.—Yellow label 692. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ, legs, left wings and abdomen.

**Phygadeuon longicornis.** Type. — Female, Harrington Coll. Pink label "P. 388." Lacks apex of right antenna.

**Phygadeuon lucens.** Type.—Female, yellow label 270. 1st Coll. Pub. Mus., Quebec. Lacks antennæ.

**Phygadeuon maculatus.** Type.—Female, yellow label 206. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ.

**Phygadeuon marginatus.** Type.—Male, Harrington Coll. One antenna and apical half of other missing.

**Phygadeuon maturus.** Type.—Female, yellow label 453. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ and left fore wing gone.

**Phygadeuon mignaulti.** Type.—Female, yellow label 661. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna.

**Phygadeuon mucronatus.** Type.—Female, yellow label 611. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon niger.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon extrematatis* Cress.

**Phygadeuon nigriceps.** Type.—Female, old rose label 40, yellow label 1179. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon nitidulus.** Type.—Male, yellow label 262. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon occidentalis.** Type.—Female, yellow label 263. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon orbitalis.** Type.—Male, yellow label 513. 2nd Coll. Pub. Mus., Quebec.

(To be continued)

## SOME SOUTH AMERICAN BEES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

### Colletes chubutensis, sp. n.

♂.—Length about 10 mm., anterior wing 7.5 mm.; head, thorax and legs black, abdomen obscure steel-blue; head, seen from in front, forming roughly an equilateral triangle, the vertex being very broad; malar space extremely long, fully twice width of mandibles at base; mandibles red at apex; labrum rather weakly plicate basally; clypeus shining, very sparsely punctured, with a broad, band-like median depression; antennæ black, long, reaching metathorax; third joint 320 microns long, fourth 480, fifth 450; mesothorax and scutellum dullish, not polished; area of metathorax smooth and shining, with a sub-basal, transverse ridge, above which, in the middle, is a small pit; hair of head and thorax very long and abundant, white on face, cheeks and under side of thorax; sides of face with black hairs; hair of upper part of head and thorax with blackish intermixed, the whole appearing grey; tegulæ piceous; wings hyaline, faintly dusky, nervures and stigma dark fuscous; second s.m. extremely broad, receiving first r.n. in middle; legs with white hair, extremely long on anterior femora posteriorly; abdomen shining, hardly punctured; hind margins of segments narrowly brownish, without hair-bands; dorsal surface

of abdomen with very long, erect hair, white basally, but mainly black on apical half.

Chubut, Patagonia (from W. F. H. Rosenberg), U. S. Nat. Museum. In Friese's table of Chilean and Argentine *Colletes* this falls nearest to *C. biciliatus* Friese (*ciliatus* Friese, preocc.). from Chile, but it appears to be certainly distinct. Unfortunately Friese gives no detailed account of the male of *biciliatus*. In the North American fauna it falls nearest to *C. productus*, except for the colour of the abdomen.

**Colletes rufosignatus,** sp. n.

♂.—Length about 8 mm., anterior wing 5.5 mm.; black, the hind margins of abdominal segments obscurely brown, and apical tarsal joints dull ferruginous; malar space long, but less than twice as long as wide; mandibles red at apex; labrum smooth and shining, without distinct plicæ or pits; clypeus shining, sparsely punctured; antennæ black, only moderately long, but middle joints longer than broad; third joint 270 microns long, fourth 320, fifth 305; hair of head and thorax long, mainly dull white with a faint creamy tint, but some long, black hairs at sides of face, and more or less fuscous on vertex, while the hair on the scutellum is light orange-ferruginous; mesothorax shining, finely but not densely punctured; area of metathorax at base with plicæ bounding a series of pits, below this rugose, but with the lower end of the triangle smooth, the smooth area bounded above by a tuft of erect hair; tegulæ black; wings hyaline; nervures and stigma piceous; legs with white hair; on middle and hind tarsi the tufts of hair at ends of joints are reddish; abdomen shining, with minute, weak punctures, and long, thin, erect hair, white basally, largely black apically, but no hair-bands.

Chubut, Patagonia (from W. F. H. Rosenberg), U. S. National Museum. Allied to *C. patagonicus* Schrottky and *C. rhodaspis* Ckll., but apparently not the male of either. The colour of the scutellar hair suggests *patagonicus*, but that insect, at least in the female, has the other hair much darker.

**Coelioxys bruneri,** sp. n.

♂.—Length 8.2 mm.; black, with the first abdominal tergite entirely, the middle third of second and a smaller area on third, bright ferruginous; legs red, black basally (including part of

femora), the hind tibiæ also dark on basal half externally, and the hind tarsi black; mandibles red subapically; antennæ black; tegulæ clear ferruginous; wings rather strongly infuscated, especially apically; hair of eyes rather short (80 microns long); face densely covered with white hair; posterior orbits, especially below, with a fringe of short, white hair; mesothorax and scutellum densely, rugosely punctured, but the posterior disc of mesothorax and a small area in middle of scutellum, smooth and shining; mesothorax very thinly hairy, but anteriorly with two oval, oblique, bright, fulvous hair-patches; scutellum with a small median tubercle, directed upward; axillar spines slender, curved inward; mesopleura thinly hairy; stigma ferruginous; nervures fuscous; anterior coxæ spined; spurs ferruginous; abdomen dorsally shining, with large, scattered punctures; hind margins of segments fringed with white hair, weak on first, and interrupted on second; venter with broad, apical margin of first segment and base of second red; no ventral keel; fourth ventral segment produced and truncate in middle of margin; fifth with an apical pit; apical teeth of abdomen six, not counting very small ones or penultimate segment; lateral teeth long and slender; lower apical longer than upper; no median denticle.

Carcarana, Argentina (*Bruner*, 65), U. S. National Museum. Very near to *C. jujuyensis* Holmbg. (♀), but apparently not its male, on account of the rugose scutellum. Also close to *C. cordillerana* Holmbg., but that has the male abdomen 7-dentate. Also allied to *C. bruchi* Schrott., but quite distinct. The apical segment of abdomen is much less produced than in *C. rufibasis* Ckll., which closely resembles it in superficial appearance, though not in structure.

**Pseudagapostemon pampeanus** (Holmberg).

A male and female from Carcarana (*Bruner*, 77, 19) are provisionally referred here, but may represent a distinct species, and it is not certain that the sexes are correctly associated. The female is very close to *P. joergenseni* (Friese), but much broader. The genus contains a number of closely related forms, the relationships of which are not clearly understood.

**Halictus (Chloralictus) bruneriellus**, sp. n.

♀.—Length about 6.5 mm., anterior wing 5 mm.; head and

thorax bluish green, legs piceous, abdomen black, the hind margins of the segments faintly reddish; hair of head and thorax scanty, white; labrum with yellowish hair; mandibles obscurely reddish in middle; apical half of flagellum ferruginous beneath; clypeus short, black, with sparse coarse punctures; supraclypeal area shining green, with a few punctures; front densely punctured; mesothorax shining, the disc with sparse, large punctures; scutellum shining; area of metathorax rugose; posterior truncation distinct; tegulæ dark reddish brown; wings hyaline, very faintly dusky, stigma and nervures reddish brown; hind spur with three teeth; abdomen shining, with only minute, indistinct punctures; no hair-bands, but the usual thin, pale hair.

Carcarana, Argentina (*Bruner* 39), U. S. National Museum. Related to *H. spinolæ* Reed (*paramario* Friese) and *H. danicorum* Ckll., but considerably larger. In the North American fauna it resembles *H. subconnexus* Ellis, but differs by the narrower face, more copiously punctured mesothorax, more dusky stigma, and rugose base of metathorax.

**Augochlora argentina** Friese.

Carcarana (*Bruner* 80). Agrees with a specimen received from Friese.

**Augochlora** (**Odontochlora**) **phoenomoë** (Schrottky).

Carcarana (*Bruner* 86).

**Augochlora** (**Pseudaugochloropsis**) **callisto** Smith.

Carcarana and Bahia Blanca (*Bruner* 8, 75).

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## A NEW HOPLIA FROM FLORIDA.*

BY W. S. FISHER, WASHINGTON, D. C.

Among a collection of Coleoptera submitted by Mr. H. L. Dozier for determination, the following interesting new species of Hoplia was found.

**Hoplia floridana,** n. sp.

*Male.*—Elongate, black, shining. Upper surface sparsely clothed with short, semi-erect lanceolate, hair-like cinereous scales. Head strongly rugose, sparsely clothed with short, erect hairs. Clypeus one-half wider than long, feebly reflexed in front, when viewed laterally, not in the same plane as rest of head, but

*Contribution from the Branch of Forest Insects, Bureau of Entomology.

April, 1918

obliquely truncate; sides nearly parallel, truncate in front with the angles rounded; surface flat with large, round punctures, clothed with inconspicuous, erect hairs. Clypeal suture prominent and strongly elevated. Prothorax one-half wider than long; sides oblique to just in front of middle, then strongly angulate and slightly concave to the posterior angles, which are rounded; front angles acute; apex broadly emarginate; base nearly truncate; disc strongly convex with the surface finely rugose and sparsely clothed with rather short, lanceolate, hair-like cinereous scales, with longer, erect hairs along the lateral margins. Elytra one-half longer than wide, slightly narrowed posteriorly, surface rather strongly rugose with only traces of costæ and clothed similar to the prothorax. Pygidium strongly narrowed posteriorly, surface densely, finely rugose and clothed with hair-like scales similar to those on the elytra. Beneath, sparsely clothed with hair-like scales as above. Posterior femora short and very much swollen. Anterior tibiæ with two large, well developed teeth. Posterior tibiæ greatly enlarged posteriorly, surface with large, round, confluent punctures. Claws of front and middle tarsi chelate and unequal, the outer one being larger and bifid at the tip. Hind tarsi with a single claw which is not cleft.

Length 10 mm.; width 4.5 mm.

*Female.*—Similar to male except as follows: Colour reddish brown, shining. Surface rather densely clothed with yellow, nearly round scales, with a few semi-erect, short, lanceolate, hair-like scales of the same colour, the scales not being abundant enough to obscure the colour of the elytra.

Length 9 mm.; width 4mm.

*Habitat.*—Lake Wales, Florida.

Holotype (male), allotype and paratype (female) in the U. S. National Museum Collection; also two paratypes (male and female) in the collection of the Florida Agricultural Experiment Station at Gainesville, Florida.

Described from five specimens, two males and three females, received from Mr. H. L. Dozier and labeled "Agric. Exp. Station, Lake Wales, Florida, Ec. No. 219 & 220, J. R. W." In a letter from Mr. Dozier he states that "These specimens were collected April 7, 1917, with a report that they were feeding on citrus foliage."

This interesting species is easily distinguished from any other North American species by its peculiar clypeus, which is obliquely truncate in front of the clypeal suture, the latter being strongly elevated, and also by the greatly swollen posterior femora and enlarged tibiæ.

## BOOK NOTICE.

THE BIOLOGY OF DRAGONFLIES (ODONATA OR PARANEUROPTERA).—By R. J. Tillyard, M.A., (Cantab.) B.Sc. (Sydney), F.L.S., F.E.S. Cambridge, The University Press, 1917. $4.50.

Since the publication in 1893 of Dr. Calvert's excellent "Catalogue of the Odonata of Philadelphia, with an Introduction to the Study of this Group of Insects," no general treatise on the biology of the dragonflies has appeared, and as Dr. Calvert's work is now long out of print and necessarily somewhat out of date, such a treatise has been much needed. Mr. Tillyard's book fills this need admirably. He has aimed "to present as full and complete an account of the biology of the Odonata as it is possible to offer in the present state of our knowledge of these insects," and he has spared no pains in carrying out this object. Every chapter bears the imprint of a thorough assimilation and careful sifting of the available data and a great deal of new matter has been added from the author's own extensive researches in many branches of the subject. With this wealth of material is combined a clearness and directness of diction, which, with the abundance of good illustrations and full glossary of technical terms should enable any biologist to follow the text without difficulty. A charm of novelty is added by the author's familiarity with the Australian fauna, from which he draws a large number of examples, in illustration of the various phenomena described.

Of the nineteen chapters ten are devoted chiefly to anatomical matters, including those on the external features, the wings, the larva or nymph, and the various organic systems. These are followed by chapters on a variety of subjects; embryology, coloration, classification, zoogeographical distribution, the geological record and bionomics; the last-named including a miscellaneous collection of facts, relating to habits, food, enemies, economic value, etc.

To these are added a chapter on British species and a final one on "Collecting, Rearing and Biological Methods."

The book teems with suggestive ideas, particularly regarding the phylogeny of various characteristic structures, such as the anal appendages, the pterostigma, the nodus and other venational features, the rectal gills of the Anisoptera, the caudal gills of the Zygoptera and the types of colour pattern. The wings of the Zygoptera are regarded as having been originally anisopterous, as were those of the fossil order Protodonata, their general reduction, especially in the anal area of the hind wings having been correlated with their use as mere "sculling organs" with no power of soaring or "planing."

In the scheme of classification adopted, the chief deviation from the systems usually followed is the separation of the family Lestidæ, with three subfamilies Epiophlebiinæ, Lestinæ and Synlestinæ. This change is based upon both imaginal (venational) and larval characters and appears to be well founded. Diagnostic characters are given for all the groups as far as the tribes.

The subject of Zoogeographical Distribution is considered from a somewhat novel viewpoint. The fauna of each geographical region is divided into three main groups, palæogenic, entogenic and ectogenic. The palæogenic fauna consists of isolated remnants of a past age, formerly more widely distributed than at present; the entogenic fauna of those groups which are most characteristic of the region in question, where they may form definite "zoocentres;" while the ectogenic fauna consists of such groups as have invaded the region from some neighbouring region in which they are entogenic. The same genus may be entogenic in more than one region. Separate tables are given of both ectogenic and entogenic genera, and their distribution in the various regions.

The fossil record, described in the next chapter, also contains many interesting suggestions, such as the probability that the larvæ of the Protodonata dwelt in damp earth rather than water, no larval forms having been preserved among the abundance of imaginal remains in the Commentry deposits, and the larval tracheal system of recent forms being a modification of an originally

terrestrial type. The remarkable forms constituting the suborder Anisozygoptera of Handlirsch are considered to be true Zygoptera of an early unreduced type, and are placed as subfamilies of Calopterygidæ and Lestidæ.

Some errors and minor defects are, of course, present in this, as in all books treating of so wide and varied a field, but as most of these have already been pointed out by other reviewers, we shall merely call attention to the following:

In the historical sketch in the introduction there is no mention of any American author. Some reference, at least, should have been made to the pioneer work of Hagen and the monumental labours of Dr. Calvert, than whom no one has done more to place our knowledge of the order on a sound and substantial basis. No mention of Bartenef's work on the Palæarctic fauna occurs in any part of the book.

On page 19 the cervical sclerites and gula are stated definitely to represent the skeleton of the last head-segment. This is by no means an established fact, as they have also been interpreted as belonging to the intersegmental membrane between the head and prothorax, being serially homologous with sclerites which are sometimes found in the two succeeding intersegmental areas.

The length of embryonic life is much more variable than is indicated (p. 242). Dr. Calvert has pointed out that in Pennsylvania the eggs of *Sympetrum vicinum*, deposited in the autumn, do not hatch until the following spring. This is also true in Ontario of *Boyeria vinosa* and almost certainly also in the case of the various species of *Æshna*.

In compiling the census of the Odonata of the world (p. 299) the Selysian monographs by Martin should not have been used for the nearctic region in preference to Muttkowski's catalogue, as they are incomplete and deficient in their treatment of the North American fauna.

We do not wish, however, to detract from the impression we have tried to give of the truly admirable qualities of Mr. Tillyard's book, for lack of space necessitates the omission of much that might be added in its praise. It is a book that is indispensable to every biological and entomological library.

Mailed April 13th, 1918.

The Canadian Entomologist.

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# POPULAR AND PRACTICAL ENTOMOLOGY.

## The Egg-Laying Habits of Some of the Acrididæ (Orthoptera).

BY NORMAN CRIDDLE, DOMINION ENTOMOLOGICAL LABORATORY, TREESBANK, MAN.

The egg-laying habits of the Orthoptera have not received as much attention as one might expect, considering the economic importance of many of the species involved. Even Riley, with all his remarkable researches, failed to observe that a locust's abdomen curls outwardly instead of under the insect when ovipositing and, strange as it may seem, his illustration has been accepted, until very recently, as correct. Much has yet to be learned regarding the exact number of eggs deposited by the various species, as well as the number of egg masses produced in a season, time of oviposition, etc. In the present paper an attempt has been made to show how some of our common Manitoba species proceed in the task of egg-laying and how the work is completed. So far as the notes presented below are concerned it will be seen that the species of Acrididæ, which oviposit in the soil, may be divided into two groups according to their method of covering the egg-sacks; the first of these comprising the Œdipodinæ, using the hind legs for that purpose, while the second—the Locustinæ—make use of the abdomen and ovipositor to attain the same end. These divisions, based upon habits, are, of course, subject to verification by the study of other species, but as they fall into natural groups there is reason to suspect that the rule will hold good, at least in those species which make an attempt to cover the eggs at all.*

With reference to the general attitude of locusts while oviposit-

*Hancock in his Tettigidæ of North America has related, with some detail, the egg-laying habits of Acrydium (=Tettix) also of *Tettigidea* in which strangely enough, the former is said to cover the eggs by use of the hind legs, while the latter uses the ovipositor.

Kellog and Gough—Rept. on Great Invasion of Locusts in Egypt in 1915 state that *Schistocerca peregrina* egg masses can be located while fresh by means of the white froth showing above the ground, hence it is probable that no covering is attempted in this species.

ing, this is usually similar to that of an individual while at rest. Occasionally, however, the legs are held rather far apart and rarely are elevated. The pictures of ovipositing females holding the posterior legs high above their body depicts a common attitude while the insect is forcing her abdomen into the soil. In the Œdipodinæ, at least, the position is so natural that it is necessary to view the insect closely to ascertain whether she is ovipositing or merely resting.

The fact that egg sacks are of various shapes is due to obstacles met with while the insect is drilling—egg masses are thus, at times, almost perpendicular, at others semi-horizontal. The natural shape is a gradual curl away from the ovipositing insect.

## Œdipodinæ.

*Arphia pseudonietana* Thom. This beautiful species reaches maturity late in summer and oviposition takes place in September and October. An individual located on September 21, 1917, had her abdomen fully inserted into the ground when she was first found, in which position she remained stationary for 24 minutes. She then withdrew her ovipositor without depositing any eggs, and moving slightly commenced a fresh hole, taking six minutes in the operation. While thus employed she rested upon her four front legs and held the hind ones in the air, kicking spasmodically with first one and then the other. Having obtained the desired depth she became motionless and remained thus for 28 minutes. She then again withdrew her abdomen and commenced a fresh hole within an inch of the last, the results of which could not, unfortunately, be ascertained owing to the observer having to hasten away to catch a train. The situation in which this locust was attempting to oviposit consisted of sparse vegetation alongside of a dry ditch, the soil being rather hard and clay-like in texture. Many individuals of the same species were present in the vicinity.

A search on October 1st was rewarded by two examples being discovered ovipositing on the edge of an old trail, their operations were evidently well under way and became completed in 26 and 33 minutes, respectively. On withdrawing their abdomens the insects remained motionless for a few seconds and then slowly commenced kicking the soil into the cavity, pushing it in from

close around first and afterwards reaching out to gather it from as far as could be conveniently reached by stretching out for it with the hind legs. This work was done very thoroughly so that no sign other than a slight elevation remained to indicate where the eggs had been laid. The hind legs are generally used alternately for this work and are applied with additional vigor as the task proceeds. Then having completed their work the locusts either hop or fly quickly away. The egg-sacks were of the usual curled shape with a neck of glutinous matter that did not quite reach to the surface of the ground. They contained 24 and 25 eggs, respectively.

*Camnula pellucida* Scudd. Several examples were observed ovipositing near Boissevaine, Man., on September 20th. The land was dry and hard, and the vegetation thin with bare spots between. Many individuals were present. The egg-laying habits of this species are very similar to those of *Arphia*, described above. One example took 23 minutes to conclude her operations from the time when she was first observed with her abdomen inserted. She then carefully filled in the cavity using both hind legs for that purpose—the egg-sack contained 18 eggs.

*Dissosteira carolina* Linn. This large species can be found ovipositing without much difficulty during the month of September. For that purpose it seeks soil which is comparatively free from vegetation and situations that are fully exposed to the sun. A large, yellow female was found on September 19, 1915, having just completed working her abdomen into the soil, from which time she took 48 minutes to finish egg laying. The hole was then covered by use of the hind legs which were applied quite vigorously, the loose earth being chiefly drawn towards the insect from behind. This egg sack was almost two inches long, of which rather more than a third consisted of neck. It contained 42 eggs. A second example observed ovipositing on September 22 occupied an hour and 19 minutes, and took three extra minutes to cover the egg cavity. This latter operation was done entirely with the left leg. Three others were found on September 28, one of which took an hour and 21 minutes from the time she was first noted with her abdomen in the soil. In these instances both hind legs were used in covering the egg chamber.

*Spharagemon collare* Scudd. Egg-laying covers approximately the same dates as the *Dissosteira*. A female was seen seeking a suitable situation on September 25, and after three attempts to insert her abdomen chose a place close to some herbage in sandy soil. The customary kicking motion accompanied the drilling process. At the end of 34 minutes she withdrew her abdomen and hopped away without depositing any eggs. A second attempt, covering approximately the same time resulted in eight eggs being laid; whereupon the locust departed without any attempt to fill in the cavity. Another female on the same date took two hours and three minutes seeking for a suitable place to oviposit, and during that time thrust her abdomen into the soil on 24 occasions, remaining in some places for 15 minutes, at others merely making a short test. She frequently returned to the same situation, as a consequence of which seven tests were made within a few inches of each other. Eventually becoming satisfied she placed her eggs among the roots of a lambs'-quarters plant, commencing at dusk and finishing at 7.50 p.m. She then carefully covered the hole with her hind legs and staggered away, being weak from the cold—the temperature registering 50 degrees F. This egg-sack had practically no neck and contained but 11 eggs. Another specimen, on September 30, covered the hole with both forward and backward kicks. The egg-sack, though considerably larger than those mentioned above, contained but two eggs. A fourth egg mass provided 12 eggs. These were all buried on stubble land.

*Spharagemon bolli* Scudd. This species is often found associating with the last, but prefers less open situations. An ovipositing female, on September 29, had chosen a place in the middle of a trail close to some trees. She remained without moving for 42 minutes from the time when first noticed. The egg chamber was covered in the usual fashion and the egg-pod, with a neck reaching almost to the surface of the ground, contained 10 eggs. A second individual located two days later did not differ in its methods from that of the above.

**Locustinæ.**

*Melanoplus atlanis* Riley. This species, known popularly as the lesser migratory locust, ranks above all our native grasshoppers

in its economic importance. The destruction wrought by it in Canada has been second to none in recent times, and its numbers have only been surpassed by its close ally *spretus*, which caused such severe losses in Manitoba during 1873 to 1875 as well as on several dates previous to these dates. *Spretus*, however, does not seem to be a native of Canada, hence *atlanis* holds first rank in destructiveness as an inhabitant of our country. It may seem strange that a species so widely distributed and so well known as *atlanis* should have had so little attention devoted to its egg-laying habits. We are, of course, aware that it seeks dry, firm soil for ovipositing in and that it prefers stubble lands or old, deserted fields for that purpose, but while I can claim to have handled hundreds of egg-pods, I have only one record of seeing this species actually ovipositing.

The individual referred to was on the border of a stubble field and had partly completed her task before being observed. This, insect on withdrawing her ovipositor, carefully shoved the loose soil into the vacated cavity by aid of the abdomen, using the valves of the ovipositor as a rake. The earth in this case was first pushed in from close around and afterwards the insect reached out to the full extent of her abdomen and drew the soil towards her. Thus, in a short time no sign of the hole remained, after which the locust hopped quickly away. This egg-pod contained 16 eggs, which is about an average for the species.

*Melanoplus angustipennis* Dodge. The Manitoba examples of this species are chiefly of the red-legged form, called by Scudder *coccineipes*. It is a common insect which is most frequently met with on edges of low bushes.

On September 19th a female was observed searching for a suitable situation for egg-laying. She had already forced her abdomen into the soil and remained in that place for 10 minutes. She then moved away and tested 14 other spots within an hour and 10 minutes. During this search she travelled over considerable ground, usually walking, occasionally hopping and twice flying. The process of inserting the abdomen occupied approximately seven minutes. The method employed, which is practically the same in all species, consists of drawing the abdominal extremity well under the insect and then raising the hind legs and

throwing all possible weight backward on to the ovipositor, the valves of which are kept constantly in motion, in which the hind legs seem, as it were, to beat time. By this method the body is rapidly worked into the soil, after which the insect becomes motionless until she has laid her eggs. Unfortunately the individual mentioned above could not be followed in her final task. A second example observed, on September 23, first drilled into a clear piece of sandy soil, where she remained for 12 minutes, then becoming dissatisfied she hopped away and rested for a short time upon some herbage. The search was then continued and two more holes made, the last of which proved satisfactory. Here she remained, with her legs stretched far apart, for 87 minutes, after which the cavity was carefully covered in the manner described under *atlanis*. This last task occupying three minutes. The slowness of her work was doubtless due to the lateness of the hour, 5.42 p.m. and the coldness of the atmosphere, 51 degrees F. The egg-sack contained 14 eggs. A third locust, noted on September 29, continued her quest for an egg site for 27 minutes, inserted her abdomen into the soil four times and made a wide circuit among low bushes before she discovered a place to her liking. This proved to be alongside of a clump of grass upon which she rested her forelegs while drilling. Egg-laying on this occasion took 37 minutes; time, 3.57 p.m.; temperature, 73 degrees F. A fourth specimen on October 1st had already inserted her abdomen when first observed, and from then took 49 minutes in ovipositing. The egg mass consisted of 14 eggs.

*Melanoplus packardii* Scudd. Two examples were found on October 1st, ovipositing on the edge of a trail. The operations were evidently well under way and soon after being observed both locusts completed their work, covering the egg chambers with the abdomen in the customary manner. Egg-sacks contained 16 and 19 eggs, respectively. A third individual found searching for an egg site on the same date postponed her search after 32 minutes, owing to the weather becoming rainy and cold. When last seen she was hiding among the grass.

*Melanoplus bivittatus* Say. This is a locust of some economic importance, especially in the vicinity of low lands. It is very easily discovered while egg-laying, owing to its habits of oviposit-

ing along roadways or on old pocket gopher hills. An individual discovered on September 9th finished her work soon after being found, and her method of covering the egg cavity did not differ from that of *atlanis*. A second example found on a trail on September 26th, produced an egg-sack, the lower two-thirds of which was almost horizontal owing to the hardness of the soil beneath. A third, located September 28th, was on the edge of a stubble field alongside of a *Dissosteira carolina*, engaged in the same operation. When first discovered the former had her abdomen fully extended into the soil but ten minutes later she abandoned this place, due to the approach of a male *Dissosteira*. She returned, however, a few minutes later, and drilled a hole close to the former, one taking ten minutes to do so. She then became motionless for 49 minutes, at the end of which her work was completed. The egg-sacks of these three individuals contained 94, 98 and 102 eggs, respectively.

## AN INTERESTING NEW HYMENOPTEROUS PARASITE.

BY A. B. GAHAN, BUREAU OF ENTOMOLOGY, U.S. DEPT. OF AGRICULTURE, WASHINGTON, D.C.

The description of this new species is desirable at this time in order to make the name available for use by Prof. S. I. Kornhauser, of Northwestern University, Evanston, Illinois, who contemplates the early publication of an account of its life-history.

Family BETHYLIDÆ.

Subfamily DRYININÆ.

**Aphelopus theliæ,** new species.

*Female.*—In Ashmead's key to species of this genus (Bull. 45, U. S. N. M.) this species runs to *melaleucus* but differs in the colour of the legs and in the absence of any white on the head. In J. J. Kieffer's key (Das Tierreich, 1914, Vol. 41, p. 215) it runs to *affinis*, but differs from the description of that species in having the face entirely black and the legs almost entirely black.

Length 2.2 mm. Black; mouth-parts except mandibles pale yellow, mandibles piceous; antennæ black, the scape beneath and the pedicel reddish; front tibiæ and tarsi more or less reddish; wings hyaline, the stigma black; veins pale. Whole head very finely, closely, almost granularly punctate, the punctures slightly

stronger on the clypeus; the anterior margin of clypeus slightly rounded; mandibles tridentate; face with a weak carinate median line extending from the base of clypeus half way to the anterior ocellus; eyes with only a very few scattered hairs, practically bare; antennal pedicel and first flagellar joint subequal, and together slightly longer than the scape; second flagellar joint a little shorter than the first; following joints to the last gradually shortening, apical joint nearly twice as long as the one before it, which is one and one-half times as long as broad; ocelli in an obtuse triangle; postocellar line much longer than the ocellocular; mesoscutum and scutellum sculptured like the head, parapsidal grooves absent; propleura longitudinally striate at least below; mesopleura a little more coarsely and irregularly sculptured than the mesoscutum; propodeum dorsally with coarse reticulations, the sides and posterior face more finely rugulose-punctate; stigma subovate, the stigmal vein slightly shorter than the width of stigma opposite; abdomen smooth and polished, ovate, a little longer than the thorax.

*Male.*—Agrees with female except as follows: palpi fuscous, antennæ wholly black, clypeus nearly truncate anteriorly, antennal joints a little more distinctly separated than in the female, the first flagellar joint scarcely longer than the second, flagellar joints beyond the first subequal except the apical one which is about one and one-half times as long as the penultimate joint.

*Type locality.*—Cold Spring Harbor, Long Island, New York.

*Type.*—Cat. No. 21604, U. S. N. M.

*Host.*—*Thelia bimaculata* Fabr.

One female and a male specimen sent to the Bureau of Entomology by Prof. S. I. Kornhauser, of Northwestern University, who is authority for the host record.

Subsequent to the drawing up of the above description, Prof. Kornhauser very kindly furnished the following note together with twenty additional specimens of the insect: "Specimens were reared from larvæ which bored through the sternites of the parasitized *Thelia*, dropped into jars of moist earth and there pupated. Fifty to seventy larvæ came from a single *Thelia*. This is a polyembryonic form. Oviposition takes place in early June, a single egg being deposited within the *Thelia* nymph. Emergence of full-grown larvæ takes place from the middle to the end of July."

# DESCRIPTIONS OF EIGHT NEW SPECIES OF COLEOPTERA IN THE FAMILY MORDELLIDÆ.

BY EMIL LILJEBLAD, CHICAGO, ILL.

In the course of the writer's studies of the Mordellidæ, several collections have been submitted to me. Among these, there are several new species, which are described in this paper. Five of these, from Texas and New Mexico, are from the collection of Mr. J. W. Green; three species, two from the Atlantic Coast, and one from the Pacific Coast, are described from the collections of C. A. Frost, F. R. Mason, and F. W. Nunenmacher.

**Diclidia propinqua,** sp. nov.

Moderately elongate, clothed with very fine silvery pubescence, finely, transversely strigate; head behind the antennæ dark reddish brown; mouth-parts testaceous; maxillary palpi scalene; antennæ testaceous, first and second joints equal, each one-third shorter than the third, third and fourth equal, fifth one-third shorter than the fourth, sixth a little shorter than the fifth, seventh to tenth equal, converging towards the apex, eleventh elongate, pointed at tip, one-third longer than the seventh; thorax testaceous, sides rounded and rapidly converging from the middle to apex; mesosternum very little compressed and elevated; elytra with scutellar cloud, the suture to middle, a median band, and the apex, black; legs testaceous; abdomen black, or very dark brown; sixth ventral segment not visible. Length 3¾ mm.

Two female specimens from Jemez Mts., New Mexico, July 12–18; collected by Mr. John Woodgate.

The type is in the possession of the writer; the paratype is in the collection of Mr. J. W. Green, from whom the specimens where received.

This species is most closely allied to *Diclidia lætula* Lec., but can readily be distinguished from it by the character of the antennal joints, and by the colour of the elytra (which are pale at the apex in *D. lætula*).

**Diclidia greeni,** sp. nov.

Moderately elongate (more robust in the female); nearly entirely testaceous or flavo-testaceous (except in some specimens, which have an indication of a dark, transverse cloud near the apex

of the elytra), densely and very finely pubescent, transversely strigose; head a little darker; eyes black, emarginate and coarsely granulated; antennæ with third and fourth joints equal, fifth one-third shorter than the fourth, sixth shorter than the seventh, seventh to tenth nearly equal and a little wider than the sixth, eleventh twice as long as the tenth; thorax about one-half broader than long, the sides rounded and rapidly converging from a little before the base; mesosternum very much compressed and elevated; abdomen of the male with two long, flattened appendages which are widened distally and obliquely truncate at the apex.

Length 3–3¾ mm.

Thirteen specimens: one male from Davis Mts., Texas, July 9; four males and eight females from Chisos Mts., Texas, July 18–22; collected by Mr. J. W. Green, to whom this species is dedicated.

The type, from Chisos Mts., is placed in the writer's collection, paratypes in that of Mr. J. W. Green.

This species differs from *Diclidia lætula* notably in the shape of the mesosternum, in the character of the antennæ, and in the nearly uniform pale colour. J. B. Smith notes that his "specimens [of *D. lætula*] vary in the distinctness of the black markings, which are sometimes barely discernible;" these pale specimens are perhaps referable to *D. greeni*, rather than to *D. lætula*.

### **Anthobates** LeConte.

*Anthobates* LeConte, in Agassiz, Lake Superior, 1850, p. 231.

This genus was based on the same type (*Anaspis trifasciata*) as *Pentaria*, and is of earlier date. The fact that the genus was based upon "false characters"* does not invalidate its use, according to opinion 14 of the International Commission on Zoological Nomenclature.

### **Anthobates dispar,** sp. nov.

Subcuneate; clothed with very fine silvery pubescence, finely transversely strigose; head testaceous or flavo-testaceous; maxillary palpi scalene, acute at tip; antennæ with the six basal joints testaceous or flavo-testaceous, seventh to eleventh fuscous, first and second joints nearly equal in length, but the second the more

*For this reason LeConte and Horn did not use *Anthobates*. (Smith. Misc. Coll., 26, 1883, p. 408).

robust, third to fifth equal, sixth a little shorter than the fifth, seventh to tenth becoming gradually wider distally, eleventh elongate, one-third longer than the tenth; eyes elongate, black, very slightly or not at all emarginate, moderately granulated; prothorax testaceous or flavo-testaceous, widest at middle, then rapidly converging towards the apex, subrectangular at base; mesosternum much compressed and elevated; elytra black, with an oblong, testaceous or flavo-testaceous humeral spot, which reaches nearly to the middle, and an indistinct subapical pale spot; abdomen black; sixth ventral segment not visible. No sexual characters have been discovered. Length 2½ mm.

Four specimens from Jemez Mts., July 15–21, collected by Mr. John Woodgate.

The type is placed in the writer's collection, paratypes in that of Mr. J. W. Green, from whom the specimens were received.

*A. dispar* does not resemble any of the described species.

**Anthobates bicolor,** sp. nov.

Subcuneate, rather robust; densely and very finely pubescent; finely transversely strigose; head black; the mouth-parts and the six basal joints of the antennæ testaceous; antennæ with first and second joints equal, rather broad, third to fifth about equal, each shorter than the second, sixth a little shorter than the fifth, seventh to tenth gradually increasing in width, eleventh elongate; eyes black, with the emargination quite deep; maxillary palpi scalene, with the inner angle rounded; prothorax black, rapidly converging from base to apex; elytra testaceous, or flavo-testaceous, with dark scutellar cloud, and narrowly black suture; legs testaceous, the femora darker; undersides of the body black; sixth ventral segment not visible.

Length 2½–3 mm.

Nine specimens, five from Davis Mts., Texas, July 6–9; four from Chisos Mts., Texas, July 19; all collected by Mr. J. W. Green.

The type from Davis Mts., is placed in the writer's collection, paratypes in Mr. J. W. Green's.

*A. bicolor* seems to be nearest to the Mexican species, *P. brunneipennis* Champion, but differs from it in having the dark colour confined to the scutellar space.

**Anthobates pallidus,** sp. nov.

Moderately elongate; entirely testaceous or flavo-testaceous (except the antennæ, which have the five apical joints fuscous, and the eyes, which are black), densely and very finely covered with pale yellow or silvery pubescence, finely transversely strigose; antennæ with first to third joints about equal in length, the first and second more robust than the third, fourth and fifth about equal, each shorter than the third, sixth to tenth gradually increasing in width, eleventh elongate-narrow, one-third longer than the tenth; eyes rather coarsely granulated, with a shallow emargination; maxillary palpi scalene, concave on distal margin, pointed at tip; prothorax evenly rounded from base to apex, with a very faint impression on each side, basal angles rectangular; sixth ventral segment not visible. Length 2—3 mm.

Eight specimens from Jemez Mts., New Mexico, June 10–21; collected by Mr. John Woodgate.

The type is placed in the writer's collection, paratypes in that of Mr. J. W. Green, from whom the specimens were received.

This species is closely allied to *A. bicolor,* but can be readily separated by the pale colour of the head, thorax and under surface.

**Mordellistena frosti,** sp. nov.

Hind tibia with one strongly marked oblique ridge, about one-fourth from apex; first joint of hind tarsus with one very small ridge near the tip.

Linear; head black; mouth-parts and anterior legs ferruginous; antennæ reddish brown; thorax fuscous or with a trace of reddish brown lustre, basal angles and a narrow line at base with golden yellow pubescence; scutellum triangular, pale, and with minute punctures; elytra black, finely punctate, covered with fine brown iridescent pubescence; under surface black; anal style short and very slender, black. Length 4mm.

Two specimens from Aziscoos Lake, Maine, July 8; collected by Mr. C. A. Frost.

The type is retained by the writer; the paratype is in the collection of Mr. Frost, from whom the specimens were received, and to whom the species is dedicated.

This species is most closely allied to *Mordellistena confusa*

Blatch., but can be distinguished from it at once by the absence of the humeral spot on the elytra.

There is a slight variation in the colour of the antennæ in the two specimens at hand, the type having the apical angles of each joint yellow, whereas the antennæ are entirely unicolorous in the paratype. This difference may prove to be sexual on the examination of a large series.

*M. frosti* should follow *M. confusa* in a systematic arrangement.

**Mordellistena masoni,** sp. nov.

Hind tibia with four strongly marked oblique ridges (and a very small rudiment of a fifth); first joint of hind tarsus with four, second with two ridges.

Subcuneate; head and thorax dark reddish brown, covered with fine golden yellow pubescence; antennæ, legs and underside a little paler; elytra dark brown, with silky, golden pubescence forming the following pattern,—an oblique band from humeri nearly to suture, an entire marginal line, widest at the middle, where it forms an abbreviated band, a sutural streak, an apical blotch connected with the marginal line, and several spots located between the bands; anal style long and slender, black at tip. Length 4 mm.

Five specimens: two from Hemlock Falls, New Jersey, July 10; two from Eagle Rock, New Jersey, July 8; and one from Westville, New Jersey, July 21; all collected by Mr. Frank R. Mason.

The type, from Hemlock Falls, New Jersey, is placed in the writer's collection, paratypes in the collection of Mr. F. R. Mason, to whom this species is dedicated.

This species is nearest *M. cinereo-fasciata* Smith, differing from it in having a narrower form, and no pale humeral spot. It can be readily recognized by the presence of light pubescent spots on the dark area. In two or three specimens the middle band reaches nearly to the suture, and the marginal line is partly broken, suggesting that further variation may be found in a large series.

This should follow *M. cinereo-fasciata* in the systematic arrangement.

**Mordellistena nunenmacheri,** sp. nov.

Hind tibia with three short, slightly oblique ridges; first joint of hind tarsus with three, and second with two ridges.

Linear; entirely black, covered with short, brown, sericeous pubescence; head large and nearly as wide as the thorax; eyes coarsely granulated; thorax longer than wide, a little wider than the elytra, its base at middle with a diagnostic, V-shaped notch as wide as the scutellum; anal style moderately long, rather robust. Length 5 mm.

Seven specimens: five from Josephine Co., Oregon, June 8, and one from Plumas Co., California, June 14; all collected by Mr. F. W. Nunenmacher.

The type from Josephine Co., Oregon, is placed in the writer's collection; paratypes are in the collection of Mr. F. W. Nunenmacher, to whom this species is dedicated.

This species is nearest *Mordellistena unicolor* Lec., or *sericans* Fall., but can at once be distinguished by the triangular-shaped notch at the base of the thorax. Some of the specimens at hand have a very small rudimentary ridge on the tibia and first joint of the hind tarsus.

This should follow *Mordellistena ambusta* in systematic arrangement.

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## NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA) PART V.

BY CHARLES P. ALEXANDER, UNIVERSITY OF KANSAS, LAWRENCE, KAS.

### Subfamily Limnobiinæ.

### Genus *Gonomyia* Meigen.

**Gonomyia (Gonomyia) kansensis,** new species.

Belongs to the *cognatella* group; antennæ orange basally; wings with cell *1st* $M_2$ open by the atrophy of the outer deflection of $M_3$; male hypopygium with the third pleural appendage powerful, bifid, the two arms subequal.

*Male.*—Length 4.5 mm.; wing 4.7 mm.

Rostrum and palpi dark brown. Antennæ with the basal segments orange, the flagellum dark brown with a dense pale pubescence. Head mostly pale, orange.

Thoracic notum brownish yellow with a sparse, grayish bloom. Pleura yellowish with a broad, dark brown, pleural stripe extending from the cervical sclerites to the base of the abdomen. Halteres

brownish. Legs with the coxæ and trochanters pale; femora and tibiæ light brown; tarsi towards the tips dark brown. Wings with a grayish yellow suffusion; stigma pale brown, indistinct; veins dark brown. Venation about as in *cognatella: Sc* ending just before the origin of the sector; cell $R_2$ very large; cross-vein *r-m* very long; cell *1st* $M_2$ open by the atrophy of the outer deflection of $M_3$; basal deflection of $Cu_1$ at the fork of *M*.

Abdomen dark brown, the tergal segments with the apical third yellow so the abdomen appears broadly annulated; hypopygium yellowish. Hypopygium of the *cognatella* type but differing notably in the details of structure: outer pleural lobe with long bristles on the outer half along the margin and a single stout bristle on the outer face near the base; pleural appendages as follows: outer appendage (*2*) (Fig. 1) very long and slender, with numerous hairs along the margin; pleural appendages *3* (Fig. 2) bifid as in *cognatella*, but shorter and more powerfully constructed, the dorsal arm blackened and strongly chitinized at its tip, the two arms about equal; appendage *d* (Fig. 3) is rather stout with about three tubercles before the apex each with a long bristle; at the tip with a long, curved bristle. Penis-guard (Fig. 4) as seen from the side shaped as in figure. Gonapophyses (Fig. 5) with an acute spine near the base.

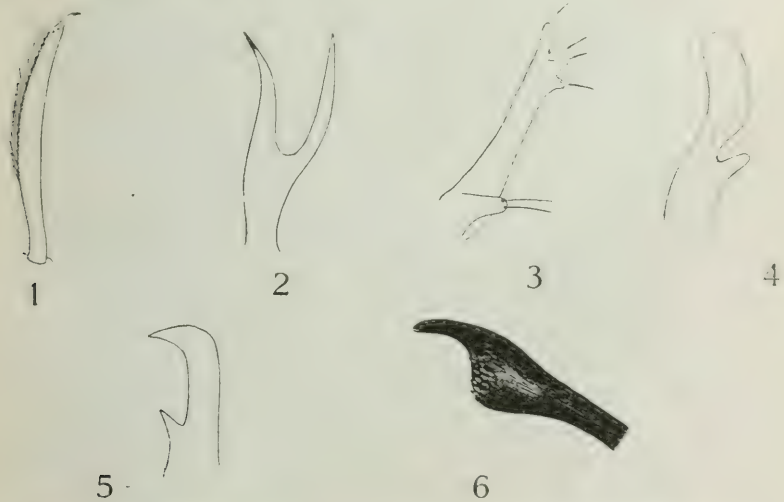


Fig. 7.—1-5, *Gonomyia kansensis*, n. sp., hypopygial details; 6, *Molophilus ursus*, n. sp., ventral hook of hypopygium.

*Habitat.*—Kansas.

*Holotype.*—♂, Jetmore, Hodgeman Co., Kansas, July 18, 1917 (Alexander).

*Allotype.*—♀, Larned, Pawnee Co., Kas., Aug. 1, 1917 (Alexander).

*Paratypes.*—4 ♀s, 1♂, with the allotype.

A review of the species of this genus in the United States will be found in the Proceedings of The Academy of Natural Sciences of Philadelphia, October, 1916, p. 508–528, Figs. 17–33, wings, and 59–91, hypopygial details. The lettering of the appendages is explained in that article under the consideration of *G. cognatella* and *G. florens*.

The majority of these specimens were taken along the Arkansas River near Larned; in life the specimens appear very pale and teneral as though not fully coloured. The immature stages are spent in the moist sand along the river, pupæ being secured from which the adults were bred.

Genus *Molophilus* Curtis.

**Molophilus perflaveolus,** new species.

Antennæ of the male not elongated; general coloration very light yellow; male hypopygium with four long, slender, chitinized appendages that are slightly curved toward their tips.

*Male.*—Length about 3.5 mm.; wing 5 mm.

Rostrum and palpi dark brown. Antennæ with the basal segments yellowish, flagellar segments brown, oval, slightly elongated, bearing long verticils that are much longer than the segments that bear them. Head reddish yellow, darkest on the disk of the vertex.

Mesonotum light orange-yellow, the interspaces with a whitish bloom, on the præscutum bearing numerous long, erect hairs. Pleura orange-yellow, sparsely white pruinose. Halteres light yellow. Legs with the coxæ and trochanters yellow; femora light brown, paler basally; tibiæ and tarsi light brown. Wings light yellowish; veins yellow with long, pale hairs. Venation somewhat as in *M. flutonensis;* basal deflection of $Cu_1$ longer than the deflection of $M_3$; $Cu_{1+2}M_3$ not twice the length of the deflection.

Abdominal segments light brown; hypopygium elongated, light yellow, the pleural hooks black; abdomen clothed with

abundant long, pale hairs. Hypopygium with the pleural chitinized hooks four in number, very long and slender, not toothed, slightly curved toward the acute tips.

*Habitat.*—California.

*Holotype.*—♂, Fieldbrook, California, May 29, 1903, (H. S. Barber).

**Molophilus spiculatus,** new species.

Antennæ of the male not elongated; general coloration brown, the pseudosutural foveæ dark brown, conspicuous; male hypopygium with the dorsal pleural appendage short and broad, the dorsal face spiculate; ventral appendage long and slender with a few scattered teeth.

*Male.*—Length about 4 mm.; wing 5.3 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown; second segment of the scape enlarged, cyathiform, dull yellowish; flagellar segments oval, slightly elongated. Eyes widely separated. Head gray, the anterior parts of the vertex and the occiput brighter coloured.

Pronotum yellow, medially with two dark brown spots. Mesonotal præscutum deep liver-brown, very sparsely gray pruinose; pseudosutural foveæ long and narrow, dark brown, conspicuous; space on the humeral angles before the foveæ yellowish continued back along the lateral margin of the sclerite to the wing-root; tuberculate pits conspicuous, separated from one another by a distance a little less than twice the diameter of one; remainder of the mesonotum bright brown. Pleura light brown. Halteres pale throughout. Legs with the coxæ and trochanters dull brownish yellow; femora dark brown apically, the basal half much paler; tibiæ dull yellow, broadly tipped with brown; tarsi brown, the basal portion of the metatarsi paler; last two tarsal segments almost black. Wings subhyaline or slightly grayish; veins brown, clothed with long, brown hairs. Venation $Cu_{1+}M_3$ about equal to the first section of $M_{1+2}$ alone.

Abdomen dark brown, the hypopygium elongated, reddish; abdomen clothed with abundant pale hairs. Hypopygium with the ventral, finger-like lobe stout with scattered elongate hairs. The four chitinized appendages of the hypopygium shaped as follows: dorsal lateral arm broad, flattened, slightly curved, on the

dorsal face set with abundant spicules, the extreme apex a cylindrical spine; this appendage is bent slightly dorsad at its tip; ventral appendage much longer and more slender from enlarged, brown bases, with about six scattered teeth, at the apex bent strongly ventrad.

*Habitat.*—Colorado.

*Holotype.*—♂, Platte Canyon, Colorado, altitude 10,000 feet, August 26, 1915, (Oslar).

Closest to *M. paulus* Bergroth (Alaska) but the hypopygial details different, the dorsal appendage of *paulus* being shaped as follows: short, bent slightly inward, the apex an acute point, the surface of the appendage indistinctly denticulate; teeth on the ventral appendage differently arranged.

**Molophilus ursus,** new species.

Antennæ of the male not elongated; general coloration dark brown, the pronotal scutellum and the humeral angles yellowish; male hypopygium short with the ventral hooks powerful, at about mid-length enlarged and densely set with sharp, appressed spines.

*Male.*—Length 3.5 mm.; wing 5 mm.

*Female.*—Length 4.5 mm.; wing 5.8 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown, the flagellar segments oval-cylindrical with long, dark verticils. Head brownish gray with long bristles.

Pronotum light yellowish. Mesonotum dark brown, sparsely gray pruinose; a conspicuous light yellowish triangle occupying the humeral portions of the præscutum before the foveæ. Pleura dark brown. Halteres dark brown, the bases pale, the knobs with pale, silky hairs. Legs with the coxæ and trochanters yellowish; femora brown, pale at the extreme base; tibiæ and tarsi dark brown. Wings dark-coloured; veins dark brown with long, dark brown hairs. Venation: $Cu_1$—$M_3$ moderate in length, a little shorter than the basal section of $M_{1+2}$; in one paratype very much shorter, subequal to the basal deflection of $Cu_1$.

Abdomen dark brown, the segments ringed caudally with paler; hypopygium short, stout, dark coloured; ventral hooks short and powerful (Fig. 7, *6*), narrow basally, gradually enlarged to about midlength, the outer angle thence produced outward as a strong, black, slightly curved tip, the middle portion of the ap-

pendage on the cephalic face densely beset with close, appressed spines.

*Habitat.*—New Mexico.

*Holotype.*—♂, Jemez Springs, New Mexico, altitude 6,400 feet, August 21, 1916. (John Woodgate).

*Allotype.*—♀, with the type.

*Paratopotypes.*—2 ♂♂.

Genus *Ulomorpha* Osten Sacken.

**Ulomorpha sierricola,** new species.

Size large, wing of the male 9 mm.; stigma of the wing pale brown, distinct.

*Male.*—Length 10 mm.; wing 9 mm.

Described from an alcoholic specimen.

Rostrum yellowish; palpi dark brown. Antennæ rather long and filiform, dark brown; flagellar segments elongate-cylindrical with numerous long bristles that are somewhat scattered, on the basal flagellar segments arranged in two distinct verticils, but on the terminal segments becoming much more scattered. Head dark brown above, paler beneath.

Thoracic dorsum dark brown, the humeral region of the præscutum paler. Pleura dull yellow. Halteres brown. Legs with the coxæ and trochanters dull yellow; femora dull yellow tipped with brown; tibiæ brownish yellow tipped with brown; tarsi dark brown. Wings with a strong, pale, brownish suffusion; stigma small, oval, brownish; veins brown; pubescence of the basal cells sparse and confined to the middle portions of the cells.

Abdominal tergites dark brown, including the hypopygium. Venation: vein $R_{2+3}$ very short to lacking so that cell $R_2$ is very short-petiolate to sessile; cell $M_1$ lacking.

Abdominal tergites dark brown, including the hypopygium; basal sternites more yellowish.

*Habitat.*—Washington.

*Holotype.*—♂, Mt. Rainier, Washington.

In its pubescent wings this species suggests *Limnophila nigrilinea* Doane, but this last-named form has the venation entirely different and the resemblance is superficial only. From *Ulomorpha pilosella* (O. S.) it may be distinguished by its con-

spicuously larger size, distinct though pale stigma and slight differences in venation.

Genus *Eriocera* Macquart.

**Eriocera brevipila,** new species.

Cell *M1* of the wings present; antennæ short in the male; size small (wing of the male about 13 mm.); general coloration light gray; body clothed with a pale, moderately long pubescence.

*Male.*—Length 10.5 mm.; wing 12.8 mm.

Rostrum dark brown; palpi elongated, black. Antennæ short (for the male sex of this group of species), if bent backward extending about to the wing-root; first segment short and stout, dark above, pale beneath; remaining segments dark brown; first flagellar segment a little reddish at the base, on the ventral face with about four stout spines. Head dull gray, on the vertex before the tubercle, surrounding the antennal bases and adjoining the inner margins of the eyes reddish; an indistinct delicate, brown median vitta.

Thorax light gray, the præscutum with four dark brown stripes, the median pair separated from one another by a distance that is a little less than the width of one, these stripes not attaining the suture; lateral stripes shorter but broader; pile on the thoracic interspaces abundant, pale, shorter than in *albihirta;* scutum gray, each lobe with two brown marks; scutellum gray with conspicuous white pile; postnotum dark brown. Pleura with a sparse pruinosity; dorso-pleural membranes more yellowish. Halteres pale, the knobs dark brown. Legs with the coxæ pale grayish pruinose with a dense white pile; trochanters dull yellowish; femora dark brown, the bases yellowish, on the four anterior legs, including only the extreme base; tibiæ brown, broadly tipped with still darker brown; tarsi dark brown. Wings with a pale, brownish gray suffusion, the costal and subcostal cells darker; stigma small, oval, brown; veins dark brown. Venation: *Sc* ending opposite the fork of $R_{2+3}$; cross-vein *r* at about one-third the length of $R_2$, far removed from the tip of $R_1$; basal deflection of $Cu_1$ nearly at the middle of cell *1st* $M_2$; cell $M_1$ present.

Abdominal tergites dark brownish gray pruinose, the apical half of the organ somewhat darker than the basal half; sternites

brown, grayish pruinose; male hypopygium small, the appendages of the pleurite long and slender.

*Habitat.*—California.

*Holotype.*—♂, Bair's Ranch, Redwood Creek, Humboldt Co., Cal., June 12, 1903. (H. S. Barber).

This species is much smaller than the related *E. albihirta* Alex., differing ,moreover, in the shorter pile and the differently constructed male hypopygium.

**Eriocera rubrinota,** new species.

Coloration of the thoracic dorsum rusty red, remainder of the body, including the basal plates of the ovipositor, dark brown; cell $M_1$ absent.

*Female.*—Length 13 mm.; wing 11.5 mm.

Rostrum very short, brown; palpi dark brown with an indistinct grayish bloom and an indistinct median brownish line; vertical tubercle low with a deep notch.

Pronotum and mesonotum deep, rusty red without apparent markings. Pleura dark brown. Halteres dark brown, the extreme bases lighter coloured. Legs with the coxæ and trochanters dark brown; femora dark brown, yellow at their bases, these pale basal portions narrowest on the fore legs, broadest on the hind legs; tibiæ and tarsi dark brown. Wings suffused with brown; veins dark brown. Venation: *Sc* ending slightly beyond the middle of $R_{2+3}$; $R_{2+3}$ a little shorter than $R_2$ alone; cross-vein *r* inserted on $R_2$, some distance beyond the fork of $R_{2+3}$; basal deflection of $Cu_1$ just beyond the fork of *M*.

Abdomen dark, shiny, blackish brown, including the basal portions of the ovipositor.

*Holotype.*—♀, in the collection of Kansas University, labeled "No. 40" without locality, but almost certainly from Western America, along with the other Williston material in the collection.

This species is abundantly different from all the forms described from the New World. It comes in the group with *E. fuliginosa* O. S., *E. tristis* Alex., etc., but is readily separated from them by the coloration of the mesonotum and the colour and structure of the ovipositor.

(To be continued.)

## LECTOTYPES OF THE SPECIES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from page 137.)

**Phygadeuon ovalis.** Type.—Female, yellow label 211. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon pallicoxus.** Type.—Yellow label 457. 2nd Coll. Pub. Mus., Quebec. Thorax, legs and wings on pin, rest missing.

**Phygadeuon parallelus.** Type.—Male, yellow label 939. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon planus.** Type.—Female, yellow label 223. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon pubescens.** Type.—Male, yellow label 273. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon rectus.** Type.—Male, yellow label 204. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon robustus.** Type.—Female, yellow label 458. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon rotundiceps.** Type.—Female, yellow label 220. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon rubricus.** Type.—Female, yellow label 701. 2nd Coll. Pub. Mus., Quebec. Extreme apex of left antenna gone.

**Phygadeuon rubrocinctus.** Type.—Female, yellow label 259. 1st Coll. Pub. Mus., Quebec. Somewhat oily.

**Phygadeuon ruficornis.** Type.—Male, yellow label 222. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon rufipes.** Type.—Not in Pub. Mus., Quebec, unless under *Platylabus lineolatus*. Prov.

**Phygadeuon segnis.** Type.—Female, yellow, label 267. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon signatus.** Type.—Female, yellow label 258. 1st Coll. Pub. Mus., Quebec.

**Phygadeuon similaris.** Type.—Male, Harrington Coll. Pink label "P. 399." Antennæ gone beyond 3rd joint; mounted so propodeum is hard to see.

**Phygadeuon subspinosus.** Type.—Male, yellow label 668. 2nd Coll. Pub. Mus., Quebec.

**Phygadeuon tegularis.** Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon alacris* Cress.

**Phygadeuon terminalis.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon caudatus.*

**Phygadeuon terminatus.** Type.—Female, yellow label 437. 2nd Coll. Pub. Mus., Quebec. Abdomen off but glued on label.

**Phygadeuon 3-annulatus.** Type.—Female, yellow label 981. 2nd Coll. Pub. Mus., Quebec. Abdomen and apices of antennæ gone.

**Phygadeuon truncatus.** Type.—Not located.

**Phylax niger.** Type.—Ent. Branch, Dept. Agr., Ottawa.

**Phyllœcus bicinctus.** Type.—Female, yellow label 180. 1st Coll. Pub. Mus., Quebec.

**Phytodietus elegans.** Type.—Female, yellow label 1653. 2nd Coll. Pub. Mus., Quebec.

**Phytodietus ornatus.** Type.—Female, yellow label 1654. 2nd Coll. Pub. Mus., Quebec.

**Phytodietus superbus.** Type.—Female, yellow label 1652. 2nd Coll. Pub. Mus., Quebec. Lacks antenna beyond annulus.

**Phytodietus zonatus.** Type.—Yellow label 514. 1st Coll. Pub. Mus., Quebec. Lacks abdomen and right antenna.

**Pimpla æqualis.** Type.—Female, yellow label 715. 2nd Coll. Pub. Mus., Quebec. Lacks apex of left antenna.

**Pimpla hirticauda.** Type.—Female, yellow label 1252. 2nd Coll. Pub. Mus , Quebec.

**Pimpla 4-cingulatus.** Type.—Female, yellow label 714. 2nd Coll. Pub. Mus., Quebec.

**Platygaster aneurus.** Type.—Yellow label 1329. 2nd Coll. Pub. Mus., Quebec. Fair.

**Platylabus aciculatus.** Type.—Yellow label 1187. 2nd Coll. Pub. Mus., Quebec. Lacks one hind leg beyond femora.

**Platylabus cincticornis.** Type.—Female, yellow label 1188. 2nd Coll. Pub. Mus., Quebec.

**Platylabus crassicornis.** Type.—Female, yellow label 1186. 2nd Coll. Pub. Mus., Quebec.

**Platylabus lineolatus.** Type.—Female, yellow label 686. 2nd Coll. Pub. Mus., Quebec.

**Platylabus magnificus.** Type.—Female, old rose label 66, yellow label 1184. 2nd Coll. Pub. Mus., Quebec.

**Platylabus mitralis.** Type.—Female, yellow label 1185. 2nd Coll. Pub. Mus., Quebec.

**Platylabus ornatus.** Type.—Female, yellow label 244. 1st Coll. Pub. Mus., Quebec. Head missing.

**Platylabus 4-carinatus.** Type.—Male, yellow label 443. 2nd Coll. Pub. Mus., Quebec. Antennæ gone.

**Platylabus rubricapensis.** Type.—Female, yellow label 717. 2nd Coll. Pub. Mus., Quebec.

**Platylabus ruficornis.** Type. — Male, Harrington Coll. Pink label "P. 417." Lacks apices of antennæ. Allotype.—Female, yellow label 1211; blue-gray label 418. 2nd Coll. Pub. Mus., Quebec.

**Platylabus scutellatus.** Type.—Yellow label 195. 2nd Coll. Pub. Mus., Quebec.

**Platylabus signatus.** Type.—Not located.

**Platymischus torquatus.** Type.—Old rose label 53; yellow label 1337. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Plectiscus gracilis.** Type.—Female, yellow label 369. 1st Coll. Pub. Mus., Quebec. Good, but part of wings on pin.

**Plectiscus niger.** Type.—Male, yellow label 723. 2nd Coll. Pub. Mus., Quebec. Part of antennæ gone.

**Podogaster radiolatus.** Type.—Female, yellow label 482. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

**Podogaster sulcatus.** Type.—Yellow label 1225. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape and abdomen gone.

**Polistes anaheimensis.** Type.—Cat. No. 1978, U. S. Nat. Mus.

**Polyblastus annulicornis.** Type.—Male, yellow label 97, also yellow label 1243. 2nd Coll. Pub. Mus., Quebec. Provancher mistook sex.

**Polyblastus decoratus.** Type.—Male, blue label 486. 2nd Coll. Pub. Mus., Quebec.

**Polyblastus dilatatus.** Type.—Female, yellow label 334. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ.

**Polyblastus gaspesianus.** Type.—Not located.

**Polyblastus inornatus.** Type.—Female, blue label 566. 2nd Coll. Pub. Mus., Quebec.

**Polyblastus quebecensis.** Type.—Female, yellow label 427. 1st Coll. Pub. Mus., Quebec.

**Polysphincta acuta.** Type.—Female, yellow label 393. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen, apices of antennæ and apical joints of hind tarsi.

**Polysphincta bruneti.** Type.—Female, yellow label 710. 2nd Coll. Pub. Mus., Quebec.

**Polysphincta cingulata.** Type.—Yellow label 486. 1st Coll. Pub. Mus., Quebec. Only thorax, left wings and a set of legs present.

**Polysphincta pleuralis.** Type.—Not in Pub. Mus., Quebec. unless under *Bassus pulchripes* Prov.

**Polysphincta rubricapensis.** Type.—Female, yellow label 403. 2nd Coll. Pub. Mus., Quebec.

**Polysphincta rufopectus.** Type.—Not in Pub. Mus., Quebec, unless under *P. limata* Cress.

**Polysphincta vicina.** Type.—Male, unlabeled. 1st Coll. Pub. Mus., Quebec. Lacks flagellum. Stands with female bearing yellow label 394.

**Pompilus apicatus.** Type.—Female, yellow label 769. 2nd Coll. Pub. Mus., Quebec. Lacks left flagellum.

**Pompilus castaneus.** Type.—Male, yellow label 774. Name label *Pompilus argenteus* Cress. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ. Proved by Prov. Catalog.

**Pompilus coquilletti.** Type.—Male, Cat. No. 1980, U. S. Nat. Mus.

**Pompilus griseus.** Type.—Male, yellow label 1011. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ; rather dirty.

**Porizon albipes.** Type.—Male, yellow labels 1554 (Prov.) and 150 (not Prov.). 2nd Coll. Pub. Mus., Quebec. Left antenna gone. Provancher mistook sex.

**Porizon angulare.** Type.—Male, yellow label 452. 2nd Coll. Pub. Mus., Quebec. Left antenna broken near base.

**Porizon boreale.** Type.—Female, yellow label 370. 1st Coll. Pub. Mus., Quebec. Head and left fore leg missing.

**Porizon californicum.** Type.—Male, small, square, white labels 34 and 2 (s); yellow label 1480. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape, left at middle, and left hind wing, gone.

**Porizon elongatum.** Type.—Male, yellow label 1226. 2nd Coll. Pub. Mus., Quebec.

**Porizon rugosum.** Type.—Male, yellow label 445. 2nd Coll. Pub. Mus., Quebec. Antennæ broken near middle.

**Posocentrus huarti.** See *Phœogenes huarti.*

**Praon simulans.** Type.—See introduction (Aphidiinæ).

**Prionony x canadensis.** Type.—Male, yellow label 1070. 2nd Coll. Pub. Mus., Quebec.

**Proctotrupes flavipes.** Type. — Yellow label 618. 2nd Coll. Pub. Mus., Quebec.

**Proctotrupes rufigaster.** Type.—Female, yellow label 641. 2nd Coll. Pub. Mus., Quebec.

**Prosapha hyalina.** Type.—Male, yellow label 1586. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape, wings on right and legs on right, except fore and hind femora, gone.

**Pteromalus acutus.** Type.—Yellow label 922. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Pteromalus nigricornis.** Type.—Yellow label 1602. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Pteromalus pieridis.** Type.—Yellow label 628. 2nd Coll. Pub. Mus., Quebec.

**Pyracmon annulatum.** Type. –Yellow label 524. 2nd Coll. Pub. Mus., Quebec. Left antenna at scape, right at middle, posterior legs except right coxa, and abdomen gone.

**Pyracmon incompletum.** Type.—Female, yellow label 1224. 2nd Coll. Pub. Mus., Quebec.

**Pyracmon macrocephalum.** Type.—Female, yellow label 305. 2nd Coll. Pub. Mus., Quebec. Antennæ gone.

**Pyracmon rufum.** Type.—Female, yellow label 1031. 2nd Coll. Pub. Mus., Quebec. Lacks apex of left flagellum.

**Radiolaria clavata.** Type.—Blue label 742(s); yellow label 1290. 2nd Coll. Pub. Mus., Quebec. Tag-mounted, right antenna broken at tip.

**Rhogas quebecensis.** Type.—Female, yellow label 545. 2nd Coll. Pub. Mus., Quebec.

**Rhogas rugosulus.** Type.—Female, yellow label 1567. 2nd Coll. Pub. Mus., Quebec. Lacks ovipositor and most of legs.

**Rhogas sancti-hyacinthi.** Type.—Female, yellow label 546. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tips.

**Rhopalicus pallipes.** Type.—Not located.

**Rhopalophorus.** See Eustalocerus.

**Ropronia pediculata.** Type.—Blue label 314, yellow label 1278. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen.

**Roptrocerus (sic) rectus.** Type.—Yellow label 1386. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Sapyga maculata.** Type.—Female, yellow label 754. 2nd Coll. Pub. Mus., Quebec.

**Sciapteryx punctum.** Type.—Yellow label 480. 2nd Coll. Pub. Mus., Quebec. Lacks hind tarsi.

**Scotioneurus dives.** Type.—See introduction (Aphidiinæ).

**Scotioneurus stenostigma.** Type.—See introduction (Aphidiinæ).

**Selandria canadensis.** Type.—Female, yellow label 1148; name label "Hoplocampa canadensis Prov." 2nd Coll. Pub. Mus., Quebec. Proved by Provancher Catalog.

**Selandria flavicornis.** Type.—Male, yellow label 60, name label "Selandria halcyon Harris." 2nd Coll. Pub. Mus., Quebec. Lacks flagellum. See introduction.

**Selandria marginata.** Type.—Harrington Coll. Flagellum wanting.

**Selandria paupera.** Type.—Yellow label 696. 2nd Coll. Pub. Mus., Quebec.

**Semiotellus cupræus.** Type.—Yellow label 920. 2nd Coll. Pub. Mus., Quebec.

**Semiotellus fasciatus.** Type.—Yellow label 226. 2nd Coll. Pub. Mus., Quebec. Fair.

**Semiotellus fuscipes.** Type.—Female, yellow label 918. 2nd Coll. Pub. Mus., Quebec.

**Semiotellus melanicrus.** Type.—Female, yellow label 627. 2nd Coll. Pub. Mus., Quebec. Fair.

**Semiotellus minimus.** Type.—Yellow label 921. 2nd Coll. Pub. Mus., Quebec. Fair.

**Semiotellus oblongus.** Type.—Female, yellow label 919. 2nd Coll. Pub. Mus., Quebec.

# AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA. (COL).

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

Not having noticed of late any list of California Cerambycidæ in any publication, I submit the following annotated list of that favourite family of collectors, the information gleaned from many fields and the note-books of many workers and collectors.

Acknowledgements are due to many of the Pacific Coast entomologists, for the greater part of the data on the insects contained in this list were obtained from their experience, particularly from Dr. Edwin C. Van Dyke. Several workers have kindly allowed me to examine their series, and a wider range of dates and localities has thus been obtained.

Many of the species I have collected in the various parts of the State during the past four years, a trip to Donner Lake and the surrounding section of the Sierras having been especially fruitful of results. Many others are unrepresented in my collection, but the data in this list on them has been procured from the collections and notes of others.

The longicorns of Lower California are included in the list because some of them are sometimes found not far from our borders, and may some day, or may have already, unknown to collectors, spread their territory into California proper.

Any changes in synonymy were suggested by Dr. E. C. Van Dyke last year while he was still on this coast. Examples of such changes are seen in numbers 100 and 69 of this list.

1. *Ergates spiculatus* LeConte.

   This is found in Northern California and the Sierras. Taken by author at Donner Lake from pupal cells in yellow pine; also breeds in other coniferous trees. June 20–August 7.

2. *Mallodon mandibularis* Harold.

   This probably occurs near Yuma, and is also found at San José del Cabo, Lower California.

3. *Mallodon melanopus* Linné.

   This was taken from pupal cells beneath bark of mesquite near Indio, Riverside County.

4. *Derobrachus geminatus* LeConte.
   This was taken at Palm Springs, Riverside County. Also present in Lower California. May 30.

5. *Prionus californicus* Motschulsky.
   This is found throughout the State and works on the roots of the coast live oak, *Quercus agrifolia*. Common. May 22–October 8.

6. *Tragosoma depsarium* Linné [*harrisii* Leconte].
   This works on tamarack and yellow pine in the Sierras, and is also found about other coniferous trees on several of which it is supposed to work. Taken by the author at Donner Lake beneath the bark of *Pinus ponderosa*. July 2.

   *Tragosoma pilosicornis* Casey.
   This is nothing more than a form of *T. depsarium*. Found on Mount Diablo.

7. *Asemum atrum* Eschscholtz.
   This is very common in the northern part of the State and in the Sierras. This opaque species breeds in the Douglas Spruce (*Pseudotsuga taxifolia*). I took it abundantly early in July at Donner Lake and Tahoe Tavern. July 3–28.

8. *Asemum nitidum* LeConte.
   At Monterey this works on *Pinus radiata*. It is also found in the Middle Sierras, Yosemite, and Tahoe. I have taken it along with *atrum* at Donner Lake and Tahoe Tavern. June 17–July 21.

9. *Nothorina aspera* LeConte.
   This most probably works in coniferous trees. Found in Siskiyou County.

10. *Criocephalus productus* LeConte.
    This beetle is found commonly throughout the northern part of the State, though but few specimens have been taken in Southern California. It works on *Pseudotsuga taxifolia*, and is supposed to work on grape-vine roots also. May 7–August 2.

11. *Criocephalus asperatus* LeConte.
This is found in the northern part of the State and the Sierras. It has been found flying around alpine fir. It probably breeds in coniferous trees, especially firs and spruces. July 20.

12. *Tetropium velutinum* LeConte.
This breeds in *Pseudotsuga taxifolia* and is moderately common in spruce forests north of San Francisco. A variety is found in the Giant Forest, Tulare County. June 1–August 9.

13. *Opsimus quadrilineatus* Mannerheim.
This breeds in *P. taxifolia* and is found from Alaska to San Francisco Bay. It probably also breeds in Sitka Spruce (*Picea sitchensis*).

14. *Dicentrus bluthneri* LeConte.
This is found in coast counties north of San Francisco and also rarely in the Sierras, near coniferous trees.

15. *Hylotrupes amethystinus* LeConte.
This is found in the Sierras from Shasta to Mt. San Bernardino, rarer in the South. Breeds in *P. ponderosa* and *Libocedrus decurrens*. Taken in numbers at Tamarack, Nevada County by the author. July 2.

16. *Hylotrupes ligneus* Fabricius.
Found through the Sierras, also in the Coast Range to Monterey. Taken by author on July 1 at Donner Lake. This breeds in *P. taxifolia* in the Sierras, *Pinus radiata* at Monterey, and probably in the sapwood of *Sequoia sempervirens* also.

17. *Hylotrupes litigiosus* Casey.
This so-called dark variety is a good species (teste Van Dyke). It breeds in the Sierra Fir near Forest Hill, Placer County.

18. *Phymatodes variabilis* Fabricius.
This is only found occasionally in imported wood.

19. *Phymatodes blandus* LeConte.
This is rarely found in Northern California. Supposed to breed in grape vine. July 16.

20. *Phymatodes obscurus* LeConte.
This is found throughout the State, and has been taken by the author at Auburn and Calistoga in August and May, respectively. It breeds in *Quercus agrifolia*. Has been reared from tan oak in Marin County by L. S. Smith, and from *Quercus lobata* in the Sonoma Valley by A. E. Wieslander. May 25–November 8.

21. *Phymatodes aeneus* LeConte.
This feeds on *P. taxifolia* and is found north of San Francisco.

22. *Phymatodes dimidiatus* Kirby.
This is a northern species, running over into this State in Trinity County. It breeds in *P. taxifolia*. July 2–August 23.

23. *Phymatodes vulneratus* LeConte.
This is quite rare, and probably breeds in oak and other soft woods. Has been beaten from *Q. agrifolia* by Van Dyke.

24. *Phymatodes varius* Fabricius.
Found from San Francisco Bay north. In Sonoma County it breeds in *Pseudotsuga taxifolia* and *Pinus radiata*. June 24.

25. *Phymatodes decussatus* LeConte.
Has been reared from white valley oak in Northern California. June 26.

26. *Phymatodes nitidus* LeConte.
Found from San Francisco Bay north. Reared from *Cupressus macrocarpa* by Nunenmacher and myself, from the sapwood of *Sequoia sempervirens* and *P. taxifolia* by Van Dyke. May 21.

27. *Phymatodes juglandis* Leng.
Taken from California walnut in Los Angeles County by Coquillett.

28. *Callidium antennatum* Newm.
This breeds in most coniferous trees, often being taken from *P. taxifolia*. Taken at San Francisco and north, also throughout the Sierras and in the San Bernardino

Mountains. Taken in abundance by the author at Willits in July. May 20–July 11.

29. *Callidium hirtellum* LeConte.
Found in the Sierras. Beaten from *P. taxifolia*, and also found about twigs of *Pinus ponderosa*. June 25–August 29.

30. *Callidium vile* LeConte.
Found near San Francisco and north. Is very rare. July 4.

31. *Xylocrius agassizii* LeConte.
This is rare in California and is a coast species. Works on gooseberry and has been beaten from willow by Van Dyke.

32. *Xylocrius cribratus* LeConte.
This is rare in California and is a Sierran species. July 17.

33. *Malacopterus lineatus* Guer.
Found along the Colorado River and out from Fort Yuma.

34. *Oeme costata* LeConte.
Found in Sierras. One taken by Van Dyke in Yosemite.

35. *Oeme strangulata* Horn.
Have no records regarding this species.

36. *Oeme gracilis* LeConte.
This has been taken by Fall and Van Dyke from Catalina Island and Los Angeles County.

37. *Eudistenia costipennis* Fall.
Five specimens have been taken by Dr. Fenyes and H. C. Fall near the summit of the Sierra Madre Mountains above Pasadena, and one by Baker near Claremont, being beaten from live oak, in which the insect probably breeds.

38. *Eucrossus villicornis* LeConte.
Found in Nevada, Arizona, and Inyo County, California. Fall has taken one in the San Bernardino Mts. Reported as attracted to light by Nunenmacher.

39. *Haplidus testaceous* LeConte.
One specimen has been taken by Van Dyke in Nevada County.

40. *Achryson surinamum* Linné.
Found normally in Southern Arizona; probably occurs in the Colorado desert. June 10–July 18. (Dates for Arizona).

41. *Hammaticherus mexicanus* Thomson.
Found at Cape San Lucas, Lower California.

42. *Brothylus gemmulatus* LeConte.
This has been taken by Van Dyke on the beach at San Francisco and at Mt. Wilson, Los Angeles County.

43. *Brothylus conspersus* LeConte.
This rarity has been taken by Kusche on dead white valley oak in Sonoma County. It is found about San Francisco Bay and north.

44. *Osmidus guttatus* LeConte.
Taken at San José del Cabo, Lower California.

45. *Gnaphalodes trachyderoides* Thomson.
Taken at San José del Cabo, Lower California.

46. *Eburia ulkei* Bland.
Taken at Cape San Lucas, Lower California.

47. *Eburia conspersa* Horn.
Found at San José del Cabo, Lower California.

48. *Romaleum simplicolle* Hald.
Taken on Catalina Island by H. C. Fall, and at Santa Monica by E. C. Van Dyke.

49. *Romaleum seminitidum* Horn.
Taken by H. C. Fall along the Colorado River.

50. *Elaphidion punctatum* LeConte.
Taken at Cape San Lucas, Lower California.

51. *Elaphidion imbelle* LeConte.
Found in Sonoma and San Diego Counties. Has been bred by Dr. Blaisdell from live oak. June 16–August 3.

52. *Elaphidion albofasciatum* Linnell.
Taken by Coquillett in the foothills along the southern border of the Mojave Desert.

(To be continued)

# KEY TO THE NORTH AMERICAN SPECIES OF AGROMYZA RELATED TO *SIMPLEX* LOEW (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

The species in this group are distinguished from their allies by the following combination of characters: Body entirely black, with sometimes a metallic bluish or greenish tinge, halteres black, costa ending at or slightly beyond apex of third vein.

Only five species are known to me, one of which is undescribed.

KEY TO SPECIES.

1. Mesonotum with 3 pairs of dorso-centrals.....2
   Mesonotum with 2 pairs of dorso-centrals.....3
2. Orbits distinctly shining; 5 pairs of orbitals present; anterior pair of dorso-centrals weak. Larvæ in twigs of willow. N. Y.; Ill.....*salicis* Malloch.
   Orbits opaque; 7 pairs of orbitals present; all 3 pairs of dorso-centrals strong. Food-plant unknown.....*tamia* Melander.
3. Abdomen with a distinct bluish tinge; cheek almost linear, not over one-eighth as high as eye. Food-plant unknown. Md.....*winnemanæ* Malloch.
   Abdomen glossy black, or at least without bluish tinge; cheek about one-fourth as high as eye.....4
4. Outer cross-vein about half its own length from inner; wings barely more than twice as long as broad; frontal and facial orbits glossy. Larvæ mining in stems of asparagus. N. J.; N. Y.; Va.; Ill.; Europe.....*simplex* Loew.
   Outer cross-vein at its own length from inner; wings about 2.5 times as long as broad; frontal orbits very slightly shining, facials opaque. Food-plant unknown. Ill.....*similata* Malloch.

*Male.*—Black; head opaque, orbits and triangle slightly shining, thorax and abdomen distinctly shining. Wings clear, veins black. Squamæ fuscous, fringes black. Halteres black.

Frons over one-third the width of head; ocellar triangle poorly defined, extending almost to anterior margin of frons; posterior

ocelli separated by nearly twice the distance between anterior and posterior ocelli; orbits narrow, about one-sixth as wide as interfrontalia; orbital bristles short, 4 in number, hairs weak and sparse; antennæ small, third joint rounded in front; arista bare, slightly swollen and pale at base, its length slightly greater than anterior width of frons; cheek one-fourth as high as eye, marginal hairs weak, more numerous anteriorly, vibrissa weakly differentiated. Mesonotum with 2 pairs of dorso-centrals; discal setulæ becoming sparse posteriorly and not continued to posterior dorso-centrals; prescutellars absent; basal pair of scutellars stronger than apical pair. Apical abdominal segment 2.5 times as long as preceding segment; hypopygium larger than in allied species. Legs rather slender; mid tibiæ with very weak posterior setulæ. Inner cross-vein below apex of first; outer cross-vein at its own length from inner; apical sections of third and fourth veins slightly divergent apically; ultimate section of fourth vein about six times as long as penultimate; last section of fifth vein about four-fifths as long as preceding section; sixth vein very distinct, ending at one-third from margin of wing.

Length 2 mm.

Type locality, Dubois, Ill., May 24, 1917 (J. R. Malloch).

Food-plant unknown.

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## BOOK NOTICE.

Biology of the Membracidæ of the Cayuga Lake Basin. By W. D. Funkhouser, Memoir 11, Cornell University Agricultural Experiment Station. Pp. 177–445, 44 plates. Ithaca, N.Y., June, 1917.

In this study Mr. Funkhouser has given us a valuable summary of his work on the Membracid fauna of the Cayuga Lake Basin, together with an excellent introduction to the general study of this attractive family.

The first part of the paper contains a useful general description of the geology, physiography and climatology of the district, and its characteristics as a faunal and floral area, followed by an account of the local Membracid fauna, the distribution of which

is considered with reference to a number of somewhat arbitrary stations into which the region is divided for convenience. Some general matters are also touched upon in this connection, such as the theories of origin of the family, paths of migration, and the general distribution of the group throughout the world. "In North America the family is best represented in Mexico, where the characteristic bizarre forms are plentiful. Southern United States shows fewer species, and these lose their grotesque appearance as they spread northward. Northern United States continues to show the thinning out of the forms as the climate becomes colder, and the native species are, on the whole, smaller and of less striking development. Canada marks the northern limit of the family and shows few representatives."

The greater part of the paper is taken up with the descriptions, bibliography and notes on the life-histories of the sixty-one species of the district, all of which are figured, the early stages as well as the adult characters being shown in many cases. There are also keys to the subfamilies, genera and species.

Following this descriptive list a number of general matters are discussed. These include a detailed account of the external anatomy, which although approached mainly from the taxonomic viewpoint will doubtless prove useful to the morphological student as well as the systematist.

The concluding portion of the book is occupied by an interesting account of the general features of the life-history, habits, host relations, ecology, etc., of the family. Among the more interesting features of their habits are those of oviposition, of which there are a number of rather distinct types. This subject is of some interest from the economic standpoint, since the only kind of real injury caused by any of the species is due to the egg-laying habit, as in the well-known case of *Ceresa bubalus*. Even this injury, however, is exceptional, and the Membracidæ are not to be regarded as of any great economic importance.

This study will be useful, not only to Hemipterists and general entomologists, but also to anyone interested in the faunal characteristics of the Cayuga Lake Basin and neighboring or similar regions.

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Mailed May 10th, 1918.

W. Hague Harrington

# The Canadian Entomologist.

VOL. L. LONDON, JUNE, 1918 No. 6

## OBITUARY.

### WILLIAM HAGUE HARRINGTON.

In the death of William Hague Harrington, which occurred at Ottawa, on March 13, 1918, the Entomological Society of Ontario lost one of its oldest members. Mr. Harrington was not only a distinguished entomologist but he was also a capable botanist, as well as the possessor of a fund of knowledge on natural history generally.

Born at Sydney, Cape Breton, N.S., on April 19, 1852, he was thus almost 66 years old when he died. His early education was received at a private school. Later he entered the Sydney Academy, distinguishing himself in all lines of study, particularly in mathematics. In 1870, he left Nova Scotia for Ottawa and in November of that year entered the Federal Civil Service, receiving an appointment in the Post Office Department. Here his ability was soon recognized, and from one promotion to another he was, in 1908, appointed Superintendent of the Savings Bank Branch, an important position in the above department. In June, 1916, after 45 years of public service he was granted superannuation, and being thus relieved of official duties, he looked forward to being able to devote himself more fully to entomological studies. Unfortunately, however, this was not to be. More recently, particularly during the past two years, a continued anaemic condition gradually undermined his system. The cold Ottawa winters were felt keenly by him, and during the summers his strength was not sufficient to allow him to undertake any important collecting or other work. Last November his condition became decidedly more serious and he was compelled to take to his bed. About that time too, he had a slight paralytic stroke. During the past winter, paralysis increased gradually and this with profound anaemia finally caused death.

In 1879, Mr. Harrington, with several other naturalists founded the Ottawa Field-Naturalists' Club, and was chosen as a member of the Committee. In 1880 he was elected Secretary-

Treasurer of the Club. In the following year he was re-elected to the same position, and in 1882, the position being divided, he was elected Secretary, which office he continued to hold until March, 1885. In that month he was honoured by being elected President of the Club.

In 1879, Mr. Harrington was also elected to the Council of the Entomological Society of Ontario; in 1891 he was chosen as first Vice-President, and from 1893 to 1895 he acted as President. For a number of years he was also a member of the Editing Committee of the Canadian Entomologist.

In 1894 he was honoured by the Royal Society of Canada, by being elected a Fellow.

The writer first met Mr. Harrington in 1899, and from that time on had the pleasure of meeting him frequently and experiencing the joy of knowing him intimately. This was made possible by that prince of good fellows, the late James Fletcher, who in winter generally arranged for a Saturday afternoon snowshoe tramp or other outing with a "camp" tea at half past six in his unoccupied (during winter) residence on the Central Experimental Farm; a friendly smoke followed, and a brisk walk of a couple of miles to the city in the evening. Harrington and the writer missed few of these pleasures.

Quiet in nature and unassuming, even retiring at times, Harrington was held in high regard by all who knew him. Early in life he became interested in natural history. His chief studies were in the Hymenoptera. He was one of the few English-speaking entomologists who enjoyed a close correspondence with that eminent French-Canadian entomologist l'Abbé Provancher. He also corresponded freely with W. H. Ashmead. During his residence in Ottawa, Harrington amassed an important collection of Coleoptera and Hymenoptera; among the latter are the types of his own species. In addition to being a systematist of recognized standing, he was also keenly interested in economic entomology, being an Active Member of the Association of Economic Entomologists.

At a meeting of the Council of the Entomological Society of Ontario, held in March last, the following letter signed by the

President and Secretary, respectively, was adopted and afterwards forwarded to Mrs. Harrington:

"The members of the Executive Council of the Entomological Society of Ontario desire to express their profound sympathy with you in the loss that you have sustained through the death of your husband, Mr. William Hague Harrington. For more than forty years he was a member of this Society and took an active interest in its welfare and shared in its work. He was regarded not only in Canada, but in the United States as well, as a thoroughly scientific entomologist, whose published contributions were distinguished by their painstaking accuracy and the many original observations contained in them. He was justly considered to be the highest authority upon hymenopterous insects in the Dominion of Canada. We deplore his loss to science and to our Society, and grieve at the removal of a colleague and friend."

The Ottawa Field-Naturalists' Club on March 15 resolved as follows:

"The Council of the Ottawa Field-Naturalists' Club has learned with deep regret of the death on Wednesday, March 13, of Mr. William Hague Harrington, F.R.S.C. Mr. Harrington was known and highly respected by entomologists, botanists and other scientific men, not only in Canada but throughout the United States as well. His studies, particularly on certain families of insects, had given him a wide reputation, and in his death the science of entomology particularly has lost a devoted worker. As a former Secretary and Past President of the Club he was held in high regard by our members."

The following is a list of Harrington's more important writings:

In the Canadian Entomologist:

Entomology for Beginners—Some Wood Eaters; 1880, 95, 258;
Field Notes; 1881, 7;
Entomology for Beginners—Long-stings; 1882, 81;
Notes on the occurrence of some species of Uroceridæ; 1882, 224;
Variations in markings of *Cicindela sexguttata;* 1883, 239;

Additions to Canadian lists of Coleoptera; 1884, 44, 70, 96, 117;
Larva of Dolba hylæus; 1884, 54;
Entomology for Beginners—Notes on a June Ramble; 1884, 101.
Notes on Tenthredinidæ, 1885; 1886, 38;
Note on *Oryssus sayi;* 1886, 30;
*Tenthredo* (?) *delta* Prov.; 1886, 32;
Notes on *Xiphydria albicornis;* 1886, 45;
*Oryssus sayi* Westwood; 1887, 81;
Hints on Collecting Hymenoptera; 1887, 115;
The Nuptials of Thalessa; 1887, 206;
Further Observations on *Oryssus sayi;* 1887, 239;
New Species of Canadian Tenthredinidæ; 1889, 95;
*Ibalia maculipennis* Hald.; 1889, 141;
Tenthredinidæ Collected at Ottawa, 1899; 1890, 23;
Two Interesting Monstrosities; 1890, 124;
On the lists of Coleoptera published by the Geological Survey of Canada, 1842 to 1888; 1890, 135, 153, 184;
Notes on a few Canadian Rhyncophora; 1891, 21, 114;
Two species of Canadian Pimplinæ; 1891, 132;
Note on *Amblyopone pallipes* Hald.; 1891, 138;
*Platynus* New to Canada; 1891, 115;
Additional Note on *Amblyopone pallipes* Hald.; 1892, 76;
Canadian Hymenoptera; 1892, 98;
Two Distinguished Settlers; 1892, 112;
Obituary; Abbé Provancher; 1892, 130;
A New *Ischalia* from Vancouver Island; 1892, 132;
Canadian Hymenoptera; 1893, 29, 57;
An Entomological Trip to Copper Cliff, Ont.; 1894, 9;
A Teratological Trio; 1894, 86;
Canadian Hymenoptera; 1894, 193, 209, 245;
*Staphylinus cæsareus* Cederh. and *S. erythropterus* Linn. in Canada; 1894, 356;
Notes on Hymenoptera; 1895, 155;
Occupants of the Galls of *Eurosta solidaginis* Fitch; 1895, 197;
Canadian Hymenoptera, No. 7; 1896, 75;
A Canadian *Triogonalys;* 1896, 108;

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island; 1897, 16, 43;
Six New Ottawa Proctotrypidæ; 1899, 77;
A Few Canadian Longicorns; 1899, 107;
Notes on Bæus; 1901, 331;
Note on *Pityopthorus coniperda;* 1902, 72;
A Canadian *Anoplonyx;* 1902, 93;
Arctic Siricoidea and Tenthredinoidea; 1903, 15;
Male Wasp with Female Antennæ; 1903, 37;

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Rhyncophora—Weevils; 1880, 80;
Some Fungi Eaters; 1881, 22;
Long-stings; 1882, 23;
House-flies; 1882, 38;
Chrysomelidæ—Leaf-eaters; 1882, 53;
Insects Collected in 1882; 1883, 35;
A New Foe to the Maple; 1883, 40;
Injurious Insects Affecting the Hickory; 1883, 42;
Notes on a June Ramble; 1884, 30;
Saw-flies (Tenthredinidæ); 1884, 63;
Hymenoptera Aculeata—Ants, Wasps, and Bees; 1885, 48;
Insects Infesting Maple Trees; 1886, 22;
The Nuptials of Thalessa; 1887, 25;
Hints on Collecting Hymenoptera; 1887, 43;
Hymenoptera Parasitica; 1890, 64;
Notes on Japanese Insects; 1891, 90;
Obituary Notice of the Abbé Provancher; 1892, 88;
Annual Address of President; 1893, 17;
Canadian Uroceridæ; 1893, 49;
Additional Notes on Japanese Insects; 1893, 50;
Notes on a Few Canadian Coleoptera; 1894, 47;
Annual Address of the President; 1894, 9.
Some Winter Insects from Swamp Moss; 1895, 47;
Some Beetles Occurring Upon Beech; 1896, 69;
Notes on the Insects of the Year 1897; 1897, 30;
Notes on Insects of the Year in Ottawa District, 1898, 87;
Notes of Insects of the Year in Ottawa District, 1899, 94;
Notes on Insects Injurious to Pines; 1902, 114;

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In the Transactions of the Ottawa Field-Naturalists' Club:

On Some Insects Captured During our Excursions; 1880, 41;
On Some Coleoptera Injurious to our Pines; 1881, 28;
List of Ottawa Coleoptera, with Introduction to Order—In this article 1,003 species are listed; 1884, 67;
Our Saw-flies and Horn-tails; 1884, 244;

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Note on Flour and Grain Beetles; 1887, 133;
Fauna Ottawaensis—Hemiptera—About 200 species listed; 1892, 25;
Entomology—Edited by W. H. Harrington; 1892, 84, 103, 113, 150, 168;
List of Coleoptera from Cypress Hills, N.W.T., 1892, 149;
Fauna Ottawaensis—Hymenoptera Phytophaga; 1893, 117;
Hymenoptera Phytophaga, 1893; 1893, 162;
Fauna Ottawaensis—Hemiptera—additional list; 1894, 66;
Unusual Abundance of Meloid Larvæ; 1895, 90;
Ottawa Spiders; 1896, 11;
Ottawa Spiders and Mites; 1897, 190;
Fauna Ottawaensis; Hymenoptera Parasitica—Proctotrypidæ; 1897, 174, 217;
Ottawa Coleoptera—Cerambycidæ; 1899, 57;
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Fauna Ottawaensis—Hymenoptera: Superfamily *II*—Sphegoidea; 1902, 215;
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Reminiscenses of Dr. Fletcher; 1909, 196;

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Canadian Uroceridæ; 1893, 131;
Catalogue of Canadian Proctotrypidæ, 1899, 169;

In the Naturaliste Canadien:

Souvenirs Entomologiques, XXVI, 65, 106.

In addition to the above, short notes, reviews, etc., were published, as well as important articles on subjects other than

entomological. His last article, "Notes on Some Ottawa District Plants" (11 pp.) was published in the February, 1917, issue of The Ottawa Naturalist. He was certainly an excellent student and most careful writer. His writings have indeed enriched our knowledge of Canadian Entomology.

His wife, one son and one daughter survive him. To them we extend our deepest sympathy in their sad bereavement.

ARTHUR GIBSON.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### EXPERIMENTS WITH CUTWORM BAITS.*

BY JOHN J. DAVIS AND C. F. TURNER, LAFAYETTE, INDIANA.

In the Emergency Entomological Service of the United States Department of Agriculture, No. 5, Sept. 1, 1917, we reported experiments to determine the suitableness of sawdust as a filler for cutworm and grasshopper poison baits in place of the increasingly expensive wheat bran. Briefly these results were as follows: Tests were made at Johnson, Indiana, in a corn field infested with so-called "over-flow worms" (*Agrotis ypsilon*). Here the regulation bran mash, that is 1 lb. poison to 25 lbs. filler (sawdust or bran), 2 quarts molasses, six lemons and water as needed. Three formulæ were used. Paris green and bran, Paris green and sawdust, and white arsenic and bran, and these were scattered broadcast at the rate of 5 lbs. per acre. The ground thus treated July 9 was re-planted to corn July 14, and counts were made July 23, with the following results:

| | |
|---|---|
| Paris green and bran | 2% plants cut. |
| Paris green and sawdust | 5% plants cut. |
| White arsenic and bran | 3% plants cut. |
| Check | 50% plants cut. |

Similarly at Akron, Indiana, experiments were conducted with Paris green and bran and Paris green and sawdust for the control of the army worm (*Cirphis unipuncta*). Two strengths

*Published by permission of the Secretary of Agriculture.

were used in each case, viz., 1 pound to 25 of filler and 1 pound to 50 of filler, the bait being scattered broadcast at the rate of 10 lbs. per acre. The applications were made late one evening, and counts made the following morning with the following results:

Paris green and bran, 1–25.....76.3% worms dead.
Paris green and bran, 1–50.....65.7% worms dead.
Paris green and sawdust, 1–25.....55.5% worms dead.
Paris green and sawdust, 1–50.....57.1% worms dead.

Examinations made two days after the application showed approximately 75% value in the sawdust bait area and practically all were dead in the bran bait area, and approximately the same results were obtained by using these baits in the furrow plowed around the field.

The continuation of these experiments has been possible through the courtesy of Prof. C. G. Woodbury, Director of Purdue Agricultural Experiment Station, who placed at our disposal space in the station greenhouse and during the months of January and February, 1918, 95 individual experiments were conducted with a view to determining the relative value of sawdust in comparison with bran, different kinds of arsenicals, and varying formulæ. The insect used in these tests was the common army worm (*Cirphis unipuncta*) and the method adopted was somewhat as follows: enamel trays 4 x 8 and 3″ deep were used, these being banded on the inside with tree tanglefoot to prevent escape of worms. Twelve army worms were used in each cage, and a small amount of poison material together with a similar amount of a comparable bait unpoisoned and wheat foliage was placed in the cage, giving the worms every possible opportunity to utilize the unpoisoned bait or foliage if they so desired. The results may be summarized as follows: Of the 18 individual experiments representing 216 larvæ, where the comparative value of bran and sawdust was tested, we found 52.5% of the worms killed where sawdust was used as a filler and 86.1% where bran was used. In the same number of experiments testing a half and half bran and sawdust mixture in comparison with bran alone we found 72.5% killed where the combination was used, and 90.7% where bran alone was the filler.

Table 1. Value of substitutes for bran in poison bait.

| Bran Versus Sawdust. | | | | Bran Versus Sawdust and Bran. | | | |
|---|---|---|---|---|---|---|---|
| Number Expts. | Number larvæ represented. | Per cent. Killed with | | Number Expts. | Number larvæ represented | Per cent. Killed with | |
| | | Sawdust bait | Bran bait | | | Sawdust & bran bait | Bran bait |
| 18 | 216 | 52.7+ | 86.1+ | 18 | 216 | 72.5 | 90.7+ |

It is thus evident that bran is noticeably superior to sawdust alone and even the combination of sawdust and bran, but these laboratory experiments in connection with the field experiments at Johnson and Akron, Indiana, show that sawdust does have some value and can be recommended where it is impossible or very difficult to obtain bran but where it is used, a second application will probably be necessary and a combination with some bran which will prevent the mixture from scattering into too fine particles and drying quickly, is preferable.

Three kinds of sawdust were used: viz., old hardwood (oak and hickory), new hardwood (hickory) and pine. The pine sawdust seemed to have a decided repellant effect and should not be used as a filler for the poison bait. In comparing new and old hardwood sawdust we found a larger percentage killed where the new was used, but our comparative tests with these materials are not sufficient to draw satisfactory conclusions. The new hardwood (hickory) was used in all experiments in comparison with bran.

The most important data obtained was a comparison between Paris green and other arsenicals. In the total number of experiments where Paris green was used, 16 in number, we killed 75.8% while calcium arsenate in 5 experiments killed 70%; sodium-arsenite in 4 experiments killed 80.8%; lead arsenate in 3 experiments, 85.8; arsenous acid (white arsenic) in 2 experiments gave 20.8%, and crude arsenous acid, a by-product of copper refineries which contained 88% of arsenous oxid, killed in 14 experiments 74.4%. It might be stated that these materials were used 1 lb. to 40 of filler, excepting in one experiment with crude arsenous oxid and one experiment with arsenous acid where it was used 1–25, and in all three experiments with lead arsenate where it

was used at the rate of 1–20. The checks in these experiments gave a death rate of 11.6%.

Table 2. Effectiveness of poisons.

Arranged in order of value according to combined effectiveness and rapidity of killing.

| Filler used | Sodium arsenite 1–40 | Paris green 1–40 | Crude arsenous 1–40 | Calcium arsenate 1–40 | Lead arsenate 1–20 | Arsenous acid | Check |
|---|---|---|---|---|---|---|---|
| Bran | 100 | 90 | 80.2+ | 86.1+ | 79.1+ | 33.3+ (1–25) | 14.5+ |
| Bran and sawdust | 75 | 75 | 72.2+ | 41.6+ | 100 | ——— | 12.5 |
| Sawdust | 50 | 52.7+ | 41.6+ | 50 | ——— | 8.3+ (1–40) | 12.5 |
| Total average | 80.8+ | 75.8+ | 74.4+ | 70 | 85.8+ | 20.8+ | 11.6+ |

Analyzing further these results and especially comparing the value of Paris green with crude arsenous oxid we find that in three experiments where sawdust was used, the Paris green killed 52.7%; in three experiments with sawdust and bran it killed 75%, and in ten experiments where bran alone was used 90%, while the experiments with crude arsenous oxid killed, in two experiments where sawdust was used, 41.6%; in three experiments where sawdust and bran was used, 72.2%, and in eight experiments where bran was used 80.2%. Where crude arsenous oxid was used, 1–40, which was the same strength as Paris green, we have a killing power very slightly in favour of Paris green, and it might be stated in this connection that crude arsenous oxid was used even as weak as 1–60 pounds of filler with very satisfactory results, and when used at the rate of 1–25 it was remarkably effective.

In interpreting these results we must consider not only the ultimate effectiveness of the individual poisons but also the rapidity with which they kill. In analyzing the results from this point of view, we find that Paris green, crude arsenous oxid and sodium arsenite killed with approximately the same degree of rapidity, sodium arsenite being a little more prompt in its action than either of the other two. During the first two days of the experiment, calcium arsenate was slower in action but in most cases

caught up with the other poisons within two and one-half days. Arsenate of lead was much slower than any of the four poisons mentioned above, although ultimately, that is at the end of five or six days, was more effective than the other poisons, although it must be remembered that the arsenate of lead bait was used twice as strong as the other poisons. Arsenous acid (white arsenic) gave the poorest results, for it was not only much slower in action but its accumulative effect was inappreciable.

Summarizing our results with poisons we can conclude that Paris green, crude arsenous oxid and sodium arsenite are the more desirable for poison baits, while calcium arsenate is next in value. Our results indicate that lead arsenate should only be used when one of the four poisons mentioned above are not available, and then it must be used at a strength of about 1–20. Our results with arsenous acid are wholly negative.

Table 3. Results from use of varying mixtures.

| Combinations tested | Bran, lem. ext. and molasses | Bran, lem. fruit and molasses | Bran and lem. ext. | Bran and lemon fruit | Bran and banana | Bran and molasses | Check |
|---|---|---|---|---|---|---|---|
| Number experiments.... | 8 | 9 | 3 | 3 | 2 | 3 | 5 |
| No. larvæ represented. | 96 | 108 | 36 | 36 | 24 | 36 | 60 |
| Per cent. killed..... | 72.7+ | 66.6+ | 72.2+ | 63.9+ | 83.3+ without molasses 66.6+ with molasses | 72.2+ | 18.3+ |

Various experiments were made to determine the effectiveness of bait prepared in different ways. That is, bait where lemon extract was used in place of lemon fruit; and with and without molasses. There was no great difference between baits prepared with bran, lemon extract and molasses; bran, lemon fruit and molasses; bran and lemon extract; bran and lemon fruit; bran and molasses and bran and bananas. However, in all of the experiments where lemon extract was used in comparison with lemon fruit, the extract gave a higher percentage of effectiveness, and these experiments, although carried on in the laboratory, seem to be sufficiently conclusive to warrant the use of lemon extract in

place of fruit if more convenient. There seems to be no noticeable difference in baits where molasses was used and where it was left out, and conversely approximately equal effectiveness was obtained where the fruit or extract was left out of the bait. We had only two experiments using banana in place of the citrus fruits, and the results were very satisfactory and warrant further trials in the field.

Tests of different formulæ to determine the attractiveness of different baits can hardly be considered satisfactory or reliable when conducted in a small pan such as we used, but it is believed that they indicate certain possibilities which should be tested in the field to determine their practical application. This summary is given for the benefit of others who may be planning work along this line the coming season.

"The crude arsenous oxid referred to above contains 85 to 92 per cent. arsenous oxid ($As_2O_3$), the sample used in our experiment containing 88 per cent., according to the analysis furnished by the U. S. Insecticide Board. It is obtainable from the Anaconda Copper Mining Company, Anaconda, Montana, through the sales agents, The United Metals Selling Co., 42 Broadway, N.Y., at 7½ cents per pound, but only in barrel lots of 400 to 500 pounds."

## NOCTUID NOTES.

BY WM. BARNES, M.D. AND J. McDUNNOUGH, PH. D., DECATUR, ILL.

We have read with great interest Mr. Wolley Dod's able criticism of the arrangement of species in our recent Check List (1918, Can. Ent., L, pp. 8–16 and 43–51). We have long regarded Mr. Dod as one of the most careful students of Noctuidæ in America and believe that, in most instances, the shifting of species advocated by him will be found to be correct. In the preparation of our Check List we found it impossible thoroughly to revise each Noctuid genus, as the work involved would have necessitated the postponement of the list for at least several more years; we, therefore, with certain minor limitations, followed the order of species as given in Hampson's Catalogue of the Lepidoptera Phalaenæ of the British Museum, although fairly certain that an intensive study of the structural details of this group, and especially of the

male genitalia, would lead to considerable alteration in the sequence of species within the genera (especially such bulky ones as *Polia*, *Hadena*, *Acronycta*, etc.) The only two genera on which we expended more than the usual amount of time and attention were *Euxoa* Hbn. and *Catocala* Schr.; our arrangement of species in this latter genus is vastly different from that given by Hampson and is based upon work done for the American Museum of New York in connection with a forthcoming Memoir on the Catocala moths; in the genus *Euxoa* we had studied rather exhaustively the male genitalia and based the specific synonymy on a comparative study of the genitalia of specimens which we had matched with type specimens in the various museums; very possibly some alteration in the sequence of species may be necessary, but (rightly or wrongly as the case may be) we believe that the synonymy is largely correct.

A few notes on some of the species which Mr. Dod discusses may be of value as giving our standpoint in the matter; we shall only touch on those species concerning which we are inclined to differ from Mr. Dod or about which we are still doubtful.

*Arctia obliterata* Stretch is not definitely known to us; we based our reference to *ornata* on the strength of the red secondaries and the figure given in Jour. N. Y. Ent. Soc., XIV, Pl. VI, Fig. 14, which looks rather like a specimen of *edwardsi* Stretch with reduced banding on primaries. We had never heard of any tendency in *turbans* to show red secondaries but if, as would appear from Mr. Dod's note, he possesses a specimen with secondaries of this colour his association would probably be more correct than our own.

*Euxoa relaxa* Sm. Our reference of this species to *septentrionalis* Wlk. is based on a study of the genitalia of the type male from San Francisco in the National Museum. The genitalia of *septentrionalis* are very characteristic and strikingly different from those of *messoria* with which it superficially agrees very closely; the salient features of the genital structure could be seen on the type of *relaxa* without removing the abdomen, and seemed to us to be identical with that of *septentrionalis*.

*Euxoa campestris* Grt. We are not surprised that Mr. Dod questions the correctness of separating this species from *declarata*

Wlk. (*decolor* Morr.). A study of the genitalia of a number of Eastern specimens convinced us that there were two very closely allied species associated under the one name and occurring apparently throughout the same general territory; the one form has the primaries very dark purple-brown with scarcely any contrasting shades and with small reniform and orbicular; the other form has a more reddish cast to the purple-brown of primaries, the reniform and orbicular are often distinctly larger and the secondaries of the ♂ appear to be paler. The two forms are extremely alike, and we must confess that individual specimens have caused us considerable trouble to place. The differences in the ♂ genitalia are slight but constant, the first form having a shorter inner branch to the harpe, the outer branch being not so evenly rounded at its base and much longer, whilst in the second form the two branches form a very regular U, and the inner is only slightly shorter than the outer. We found considerable difficulty in determining whether names were valid for each of these species. *Declarata* Wlk., the oldest name available, we knew was based on a Vancouver Island male; we had seen the type once but this was before we had realized the existence of two species; from the specimens before us from this region we believed it would apply to the second form and used it in this sense in our list. *Campestris* Grt., another available name, was first described in the October number of the Can. Ent., 1875, VII, 188; a few months later (December) a redescription appeared in the Proc. Acad. Nat. Sci. Phil., p. 423. The specimens from which the description was drawn were from Orillia, Canada, (Norman); N. Y. (Mead); Vancouver Is. (Hy. Edwards), and in the December number of the Can. Ent. for the same year Grote figured the Orillia specimen, a female, (Pl. 1, Fig. 6) designating it (p. 227) as the type. We believe that this action on Grote's part must be taken as definitely fixing the type specimen and that, therefore, the specimen in the British Museum, a ♀ from New York, which bears the type label can at the most be considered a Paratype. Very possibly the Orillia specimen is also in the British Museum as Hampson's catalogue mentions a female from Canada (Norman); if so it should be marked as type; it will be interesting to discover whether the two specimens, the real type and the pseudo-

type, represent the same species or whether Grote's type series was mixed. Judging by his figured type we were led to apply the name *campestris* to the first form mentioned by us, but this will need verification by an actual examination of the specimens, which possibly Mr. Dod can carry out.

*Decolor* Morr. presents a still more difficult and unsatisfactory problem, since the type specimens cannot be found and are probably destroyed; we placed the species tentatively as a synonym of *declarata* but should not be surprised if it really were found to be a dark form of *tessellata;* the original description (1874, Proc. Bost. Soc. N. Hist., XVII, 162) is poor but mentions a dark, terminal area and dark space between the spots, also a whitish hind-wing with dark border; in Can. Ent. VII, 214, Morrison elaborates on his previous description but his series then probably contained both forms, and his remark about a yellow spot being present at the base of the tegulæ certainly savors of *tessellata*, although the fact that a slight, whitish scaling is often visible in *declarata* makes it impossible to definitely refer *decolor* to *tessellata* on these grounds.

*Euxoa orbicularis* Sm. The specimens figured by us (Contr. 1, (4), Pl. XVII) as this species does not belong here at all but should be referred to *remota* Sm., a species doubtfully distinct from *tessellata*. The true *orbicularis*, the type of which we have seen in the Tepper collection, is an entirely different species which we have not yet satisfactorily indentified in our material, but which seems best placed somewhere near *mærens* Grt.

*Euxoa remota* Sm. We cannot agree with Mr. Dod in referring *tristicula* to this species; it is true that the ♀'s in the Hy. Edwards' collection represent *nesilens* but the ♂ specimen in the National Museum, labeled "type" and to which the name must be held is a form (superficially like *nesilens* we admit) closely allied to some of the *tesselloides* forms and well matched by the specimen we figured as *orbicularis* (Pl. XVII, Fig. 16).

*Graptolitha winnipeg* Sm. If a specimen before us compared with type and marked "exact" be correct, we cannot agree with Mr. Dod's reference of this species to *laticinerea*. The colour of the primaries in *winnipeg* is a distinctly dark blue-gray without the greenish tinge found in *laticinerea;* a reference of *winnipeg* to *unimoda* would have surprised us less.

## LECTOTYPES OF THE SPECIES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D.C.

(Continued from page 171.)

**Semiotellus suborbicularis.** Type.—Yellow label 972. 2nd Coll. Pub. Mus., Quebec. Fair.

**Sigalphus canadensis.** Type.—Female, 2nd Coll. Pub. Mus., Quebec, pinned opposite male with name label and yellow label 594. Both lack head, type has wings crumpled.

**Sigalphus trisectus.** Type.—Male, blue label 115; yellow label 1302. 2nd Coll. Pub. Mus., Quebec.

**Spalangia aenea.** Type.—Harrington Coll.

**Spathius laflammei.** Type.—Female, yellow label 563. 2nd Coll. Pub. Mus., Quebec. Dirty, apices of antennæ gone.

**Sphacophilus crawii.** Type.—Cat. No. 1979, U. S. Nat. Mus.

**Sphaerophthalma alveolata.** Type.—Yellow label 1685. 2nd Coll. Pub. Mus., Quebec. Tagged "Cap Rouge."

**Sphaerophthalma argentipilis.** Type.—Male, white label 17 (in pencil); yellow label 1406. 2nd Coll. Pub. Mus., Quebec.

**Sphaerophthalma unicincta.** Type.—Yellow label 751. 2nd Coll. Pub. Mus., Quebec.

**Sphaeropyx ovalis.** Type.—Female, yellow label 1272. 2nd Coll. Pub. Mus., Quebec. Fair. Badly tagged.

**Sphaeropyx parvus.** Type.—Female, yellow label 1027. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ gone.

**Sphaeropyx quebecensis.** Type.—Female, yellow label 601. 2nd Coll. Pub. Mus., Quebec. Right antenna and apex of left, gone.

**Steniola duplicata.** Type.—Male, yellow label 1614. 2nd Coll. Pub. Mus., Quebec. Apex of left antenna gone.

**Stilpnus appendiculatus.** Type.—Not located.

**Stilpnus canadensis.** Type.—Male, yellow label 234. 1st Coll. Pub. Mus., Quebec. Antennæ broken at apex; abdomen, right fore-wing and all legs except one front one broken off; abdomen and part of legs glued on yellow label.

**Stilpnus deficiens.** Type.—Harrington Coll. Antennæ missing and wings dirty.

**Stilpnus laevis.** Type.—Yellow label 702. 2nd Coll. Pub. Mus., Quebec. Antennæ (right at 7th joint, left at scape), legs on right side at coxæ, left hind leg, right fore-wing and abdomen gone.

**Strongylogaster abnormis.** Type.—Female, yellow label 1147. 2nd Coll. Pub. Mus., Quebec. Allotype.—Male without label.

**Strongylogaster albosectus.** Type.—Female, yellow label 96. 1st Coll. Pub. Mus., Quebec. Lacks right flagellum. Two specimens without labels.

**Strongylogaster impressatus.** Type.—Not located.

**Strongylogaster luctuosus.** Type.—Female, Harrington Coll.

**Strongylogaster pallicoxus.** Type.—Female, yellow label 1149. 2nd Coll. Pub. Mus., Quebec. Allotype—Male, Harrington Coll. Paratype.—Female, also Harrington Coll.

**Strongylogaster politus.** Species must be accredited to Cresson. Type.—Female, Philadelphia No. 274. Male, yellow label 498; 1st Coll. Pub. Mus., Quebec, not a type.

**Strongylogaster proximus.** Type.—Female, Harrington Coll. Paratype.—Yellow label 1159. 2nd Coll. Pub. Mus., Quebec.

**Strongylogaster soriculatus.** Type.—Female, yellow label 692; name label "Strongylogaster soriculatipes Prov." in Prov. hand. 2nd Coll. Pub. Mus., Quebec.

**Synairema americana.** Type.—Female, yellow label 1081. 2nd Coll. Pub. Mus., Quebec. Lacks right flagellum.

**Synairema pacifica.** Type.—Female, Harrington Coll. Antennæ and right fore-wing gone.

**Synaldis pilicornis.** Type.—Female, yellow label 1165. 2nd Coll. Pub. Mus., Quebec. Ovipositor broken off.

**Syntomaspis splendens.** Type.—Harrington Coll. Abdomen missing.

**Tapinoma boreale.** Type.—Yellow label 1403. 2nd Coll. Pub. Mus., Quebec. Eight specimens on one tag. Badly glued.

**Taxonus floridanus.** Type.—Cat. No. 13965, U. S. Nat. Mus. Paratype.—Yellow label 1540. 2nd Coll. Pub. Mus., Quebec.

**Taxonus parens.** Type.—Female, Harrington Coll. Antennæ wanting.

**Taxonus robustus** Type—Yellow label 931. 2nd Coll. Pub. Mus., Quebec. Flagellum gone.

**Telenomus rufoniger.** Type.—Yellow label 1364. 2nd Coll. Pub. Mus., Quebec. Fair.

**Telenomus stygicus.** Type.—White label 20; yellow label 1120. 2nd Coll. Pub. Mus., Quebec Abdomen gone.

**Tenthredo atrocoerulea.** Type.—Not located. Probably returned to collector. (Geddes).

**Tenthredo basilaris.** Type—Female, yellow label 58 and name label *Tenthredo signata* Nort. 2nd Coll. Pub. Mus., Quebec. Proved by Prov. Catalogue.

**Tenthredo cingulata.** Type.—Female, yellow label 59, and name label *Tenthredo verticalis* Say. 2nd Coll. Pub. Mus., Quebec. Proved by Prov. Catalogue.

**Tenthredo decorata.** Type.—Not located.

**Tenthredo erythromea.** Type.—Harrington Coll. Female. Paratype.—Yellow label 1154. 2nd Coll. Pub. Mus., Quebec.

**Tenthredo jocosa.** Type.—Female, yellow label 494. 2nd Coll. Pub. Mus., Quebec.

**Tenthredo lineata.** Type.—Female, yellow label 63. 2nd Coll. Pub. Mus., Quebec. Lacks part of flagellum.

**Tenthredo mellicoxa.** Type.—Female, yellow label 109; white label "109 mellicoxa." 1st Coll. Pub. Mus., Quebec.

**Tenthredo montana.** Type.—Not located. Probably returned to collector. (Capt. Geddes.)

**Tenthredo nigricostata.** Type.—Female, Harrington Coll. Lacks antennæ.

**Tenthredo pallicoxa.** Type.—Female, yellow label 69. 2nd Coll. Pub. Mus., Quebec. Rather dirty.

**Tenthredo ruficoxa** Type. — Female, Harrington Coll. Right median tarsi gone, slightly dirty.

**Tenthredo terminalis.** Type.—Male, Harrington Coll. Left flagellum gone.

**Tetrastichus trisulcatus.** Type.—Harrington Coll. Fair. Allotype.—Yellow label 1377. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Thalessa quebecensis.** Type.—Not located.

**Theocolax canadensis.** Type.—Yellow label 1030. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Thersilochus errabundus.** Type.—Harrington Coll.

**Thersilochus maturus.** Type.—Female, yellow label 1227, blue label 106 (s). 2nd Coll. Pub. Mus., Quebec.

**Thersilochus micans.** Type.—Female, yellow label 372. 1st Coll. Pub. Mus., Quebec. Allotype.—Male, yellow label 1040. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape missing, abdomen broken off at petiole but glued on yellow label.

**Thersilochus pallipes.** Type.—Female, yellow label 676. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tips.

**Thyreocera læviscutum.** Type.—Yellow label 1322. 2nd Coll. Pub. Mus., Quebec. Badly glued.

**Thyreopus elongatus.** Type.—Not located.

**Thyreopus rugosopunctatus.** Type.—Female, blue-green label 851(s); yellow label 1445. 2nd Coll. Pub. Mus., Quebec.

**Thyreopus sinuatus.** Type.—Not located. Probably returned to collector.

**Tiphia minor.** Type.—Not located.

**Trichacius clavatus.** Type.—Blue label 764; yellow label 1376. 2nd Coll. Pub. Mus., Quebec. Fair.

**Trichacis auripes.** Type.—Not located.

**Trichiosoma taylori.** Type.—Female. Lacks left antenna. Allotype—male. Ent. Branch, Dept. Agr., Ottawa. Male paratype.—Yellow label 1151. 2nd Coll. Pub. Mus., Quebec.

**Trogus canadensis.** Type.—Female, yellow label 241. 1st Coll. Pub. Mus., Quebec. Allotype.—Male, yellow label 194. 2nd Coll. Pub. Mus., Quebec.

**Trogus quebecensis.** Type.—Female, yellow label 240. 1st Coll. Pub. Mus., Quebec. Right antenna gone.

**Tropistes elegans.** Type.—Not in Pub. Mus., Quebec, unless under *Arotes amoenus* Cress.

**Tryphon canaliculatus.** Type.—Female, yellow label 325. 2nd Coll. Pub. Mus., Quebec. Fair.

**Tryphon clapini.** Type.—Female, yellow label 421. 1st Coll. Pub. Mus., Quebec.

**Tryphon clypeatus.** Type.—Male, yellow label 333. 2nd Coll. Pub. Mus., Quebec.

**Tryphon dionnei.** Type.—Female, yellow label 657. 2nd Coll. Pub. Mus., Quebec. Lacks left flagellum.

**Tryphon dorsalis.** Type.—Female, yellow label 363. 2nd Coll. Pub. Mus., Quebec.

**Tryphon dufresnei.** Type.—Female, not located. Allotype.—Male, yellow label 329. 2nd Coll. Pub. Mus., Quebec.

**Tryphon excavatus.** Type.—Female, yellow label 1560. 2nd Coll. Pub. Mus., Quebec. Lacks apex of right antenna.

**Tryphon fractus.** Type.—Male, blue label 560. 2nd Coll. Pub. Mus., Quebec.

**Tryphon hervieuxii.** Type.—Female, yellow label 656. 2nd Coll. Pub. Mus., Quebec. Head gone.

**Tryphon pediculatus.** Type.—Male, yellow label 1236. 2nd Coll. Pub. Mus., Quebec.

**Tryphon rufigaster.** Type.—Female, yellow label 1562. 2nd Coll. Pub. Mus., Quebec.

**Tryphon rufopectus.** Type.—Male, yellow label 1563. 2nd Coll. Pub. Mus., Quebec. Poor condition, apices of flagellum gone.

**Tryphon scutellaris.** Type.—Not in Pub. Mus., Quebec, unless as var. of *dufresnei* Prov.

**Tryphon tuberculifer.** Type.—Female, yellow label 1237; labeled "Tryphon tuberculiferus Prov." 2nd Coll. Pub. Mus., Quebec.

**Trypoxylon striatum.** Type.—Not located. Probably returned to collector.

**Urocerus tricolor.** Type.—Female, yellow label 72. 2nd Coll. Pub. Mus., Quebec.

**Westwoodia fumipennis.** Type.—Female, yellow label 388. 1st Coll. Pub. Mus., Quebec.

**Xiphidion canadensis.** Type.—Female, yellow label 138. 1st Coll. Pub. Mus., Quebec.

**Xiphydria canadensis.** Type.—Female, yellow label 137. 1st Coll. Pub. Mus., Quebec. Apices of left wings wanting.

**Xorides canadensis.** Type.—Not in Pub. Mus., Quebec, unless under *Xylonomus albopictus* Cress.

**Xylonomus calidus.** Type.—Female, blue label 596, in large figures. 2nd Coll. Pub. Mus., Quebec.

**Xylonomus lavallensis.** Type.—Not in Pub. Mus., Quebec, unless under *Xylonomus humeralis* Say.

**Zele basalis.** Type.—Female, white label 81; yellow label 1483. 2nd Coll. Pub. Mus., Quebec. Badly tagged.

**Zele cinctus.** Type.—Male, yellow label 729. 2nd Coll. Pub. Mus., Quebec. Abdomen, left legs, left fore-wing and part of antennæ gone.

**Zele curtus.** Type.—Female, blue label 277(s); yellow label 1276. 2nd Coll. Pub. Mus., Quebec. Wings somewhat matted.

**Zele gracilis.** Type.—Male, yellow label 1277. 2nd Coll. Pub. Mus., Quebec. Badly tag-mounted.

**Zele palliventris.** Type.—Female, yellow label 573. 2nd Coll. Pub. Mus., Quebec. Lacks left flagellum and all legs except left front leg; abdomen glued on card.

**Zele rufipes.** Type.—Female, yellow label 731. 2nd Coll. Pub. Mus., Quebec.

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## THE EARLY STAGES OF EMPOASCA TRIFASCIATA GILL.[1]

BY HARRY B. WEISS AND EDGAR L. DICKERSON,*
NEW BRUNSWICK, N. J.

While not recorded in Smith's List of the Insects of New Jersey, this attractive little leaf-hopper appears to be fairly well distributed in New Jersey, having been found by the writers on poplar at Irvington, Red Bank, Ridgefield, Trenton and New Brunswick. De Long in his "Leafhoppers or Jassoidea of Tennessee" (Bull. 17, Vol. V, No. 2, Tenn. State Bd. Ent.) records it as being swept from cottonwood at Clarksville, Tenn., and Van Duzee in his check list of the "Hemiptera of America, North of Mexico," gives its distribution roughly as "Eastern States to the Mississippi Valley and Eastern Canada." It was described by Gillette in the Proc. U. S. Nat. Mus., vol. XX, p. 726 (1898) from specimens taken at Douglas Co., Kansas, Champaign, Ill.,

[1] Identified by E. P. Van Duzee.

*The arrangement of the authors' names has no significance, and indicates neither seniority nor precedence.

and Ames, Iowa, having been found on cottonwood at the latter locality.

In New Jersey it has been found on both Carolina poplar (*Populus deltoides*) and Lombardy Poplar (*Populus nigra italica*) principally on the former. Over-wintering takes place in the egg stage, the eggs being found in young twigs and hatching occurs

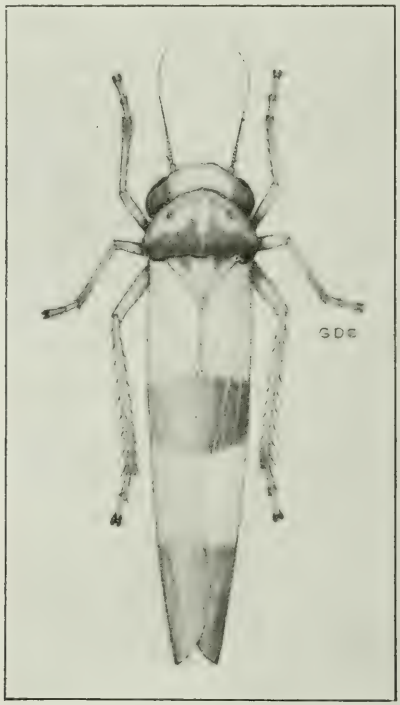


Fig. 8.—*Empoasca trifasciata* Gill.

during the last of May or first part of June. From three to four weeks are required for the nymphal stages, and by the last of June or first of July, adults of the first brood are present. Summer eggs are then deposited in the tissue of young twigs, and these hatch during the last week of July. By the last of August, adults of a second brood are present. Winter eggs are deposited during

September, and the adults linger on the trees until the cool weather of early October.

Both the nymphs and adults are very active. After hatching, the nymphs make their way to the leaves and can be found on both surfaces, principally the lower. They appear to scatter considerably after the early stages. In one instance only, early in the season, a colony of nymphs was found, but during the remainder of the season, all stages of the nymphs were found singly on the leaves and scattered over the trees. When many nymphs are present, their feeding produces a characteristic, whitish discolouration of the upper leaf surface.

The adults are extremely active and scatter soon after emergence. On rainy days they exhibit a tendency to collect to a certain extent on the foliage, and at these times many can be obtained without difficulty.

*Egg.*—Length 0.92 mm., width 0.15 mm. Translucent, cylindrical, elongate, sides parallel; basal end rounded; neck bent slightly to one side; slightly curved when viewed laterally. The eggs appear to be laid singly in the last made growth of the twig. The position of each egg is indicated by a blister-like elevation of the bark about one-sixteenth of an inch in diameter. These blisters may be either circular or oval. Each egg is firmly embedded in the tissue under the bark with its long axis parallel to the twig and with its cap facing the bark. Upon removing the blister-like elevation of the bark, only a slight discolouration of the green tissue indicates the presence of an egg. On account of their translucence, they blend with the tissue and are easily overlooked unless a careful search is made. The blisters are found anywhere on the young twigs, sometimes in groups of two or three, but more often widely removed from each other.

*First stage nymph.*—Length 1.25 mm., width of head including eyes 0.26 mm. Shape elongate, broadest at head and fore part of abdomen, tapering posteriorly. Dorsal surface reddish brown. Fine median white line on front of head and dorsal surface of head and thorax. First and second abdominal segments white. Dorsal surface of head, each thoracic and abdominal segment bearing transverse rows of hairs; several hairs on head and a transverse row on posterior margin of each thoracic and abdo-

minal segment. Eyes prominent. Antennæ reddish brown, about one-half the length of the body. Legs reddish brown except coxa, trochanter, basal portion of femur, apical end of tibia and base of tarsus which are light. Femur and tibia bearing hairs. Rostrum extending to second pair of legs.

*Second stage nymph.*—Length 1.72 mm., width of head including eyes 0.46 mm. Similar to first stage but slightly darker. Median line indicated on dorsal surface.

*Third stage nymph.*—Length 2.1 mm., width of head including eyes 0.5 mm. Similar to preceding stage but slightly darker. Dorsal surface of thorax depressed. Sides of mesothorax extending half way through metathorax. Metathorax extending slightly at sides. Antennæ two-fifths the length of the body.

*Fourth stage nymph.*—Length 2.8 mm., width of head including eyes 0.7 mm. Similar to third stage but darker. Light median dorsal line indicated on abdomen in some specimens. Wing-pads of equal length, decidedly more pronounced, narrow, extending to the third abdominal segment.

*Fifth stage nymph.*—Length 3.5 mm., width of head including eyes 0.75 mm. Dorsal surface dark, reddish brown. Fine median line on front and dorsal surface of head and thorax. A light patch on each side of line on head. Median posterior portion of mesothorax white. Surface of metathorax white, tinged with brown. Wing-pads of equal length, long, narrow, reaching fourth abdominal segment. Fine, median, dorsal line indicated on abdomen. Eyes prominent. Antennæ reddish brown, basal joints darker, one-third length of body. Legs, light reddish brown, lighter at base of femur and tip of tibia. Coxa and trochanter white. Rostrum white, reaching to between second pair of legs.

*Adult.—Empoasca trifasciata* Gillette. The description of this species by Gillette in "American Leaf-hoppers of the Subfamily Typhlocybinæ" (Proc. U. S. Nat. Mus., vol. XX, p. 726) follows: "Pale green, with three transverse, smoky bands above. Length 4 mm. Face golden yellow above, shading into green on the clypeus, with a broad, whitish, median stripe; face fully as long as broad. Front with sides nearly parallel, two-thirds longer than broad between the eyes, very obtusely rounded above. Clypeus about one-third longer than broad, a little less than one-

half the length of the front, broad at the base, constricted at the upper one-third, rather blunt at the apex. Genæ appearing as a mere line past the loræ but nearly attaining the tip of the clypeus; genæ, loræ and clypeus pale green. Vertex slightly longer at the middle than at the eyes, very obtusely rounded in front, colour golden yellow, paler on posterior margin, having a slender, dark median line, ocelli pits large and pale in colour, but no ocelli; eyes very black and large, shortest distance between the eyes 1.7 times the length of the vertex at the middle. Pronotum twice the length of the vertex and nearly twice as wide as long; anterior two-thirds golden yellow, the remainder black. Scutellum bright green at tip but somewhat smoky on posterior portion. Elytra pale green, a deep smoky transverse band at the middle of the clavus, not quite attaining the costal margin, the apical area deep smoky on inner half, second apical cell with a short peduncle. Tergum washed with golden yellow, venter pale green, tips of pygofers and ovipositor deep green. Legs pale green with tips of tibiæ and tarsi deep blue green."

## AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA.

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

(Continued from page 177.)

53. *Aneflus volitans* LeConte.
    Found at San José del Cabo, Lower California.
54. *Aneflus prolixus* LeConte.
    Found at Cape San Lucas, Lower California.
55. *Aneflus protensus* LeConte.
    Found at Cape San Lucas, Lower California.
56. *Aneflus linearis* LeConte.
    Found at Cape San Lucas, Lower California.
57. *Eustroma validum* LeConte.
    Found in Southeastern California and at San José del Cabo, Lower California.
58. *Compsa puncticollis* LeConte.
    Found at San José del Cabo, Lower California.
59. *Compsa quadriplagiata* LeConte.
    Found at Cape San Lucas, Lower California.

60. *Poecilobrium chalybæum* LeConte.
Found in the middle part of California, common on flowers of Ceanothus at Pasadena; also on poison oak flowers in Sonoma Co. June 3–July 7.

61. *Poecilobrium rugosipenne* Linnell.
One specimen taken from California.

62. *Eumichthus oedipus* LeConte.
Found in Humboldt and Sonoma Counties on flowers of Spiraea.

63. *Phyton discoideum* LeConte.
Found at Cape San Lucas, Lower California.

64. *Hybodera tuberculata* LeConte.
A number of specimens have been taken by Ricksecker at Camp Meeker, Sonoma County. Breeds on maple in Washington.

65. *Hybodera debilis* LeConte.
Found in Los Angeles County by Fall. Has been beaten from live oak in the Bay Counties by Van Dyke.

66. *Callimus cyanipennis* LeConte.
Found occasionally in Northern California and Sierras. Taken frequently in Southern California, at Los Angeles on Ceanothus by Fall. Found on Ceanothus, Spiraea, and other flowers by Van Dyke.

67. *Callimus ruficollis* LeConte.
Found commonly in Northern California on Ceanothus and poison oak flowers by Van Dyke. I found this so numerous in June in Lake County as to be present in almost every sweeping of poison oak; so numerous that most were allowed to escape. June 7–July 9.

68. *Megobrium edwardsii* LeConte.
This has been found on live oak at Pomona by Fall, on oak at San Diego by Blaisdell, taken from Ceanothus twigs at Monterey by Slevin, and also found at Santa Rosa Island.

69. *Callimoxys sanguinicollis* Olivier (*C. fuscipennis* Lec.—male).
Found rarely in Southern California, common in Northern California on flowers of Ceanothus and poison oak. June 1–July 3.

70. *Molorchus longicollis* LeConte.
Found rarely in Southern California, common in Northern California on Ceanothus and various other flowers. June 13.

71. *Rhopalophora bicincta* Horn.
Found in Lower California.

72. *Rhopalophora rugicollis* LeConte.
Found in Lower California.

73. *Holopleura helena* LeConte. (*H. marginata* Lec.—female).
Found in Northern California and Sierras, rare in Southern California. Bred by the author from laurel at Oakland, Alameda Co. June 28–July 3.

74. *Rosalia funebris* Motschulsky.
This is common in the redwood belts of Marin and Sonoma Counties. Breeds in laurel (*Umbellularia californica*). In State of Washington it breeds in ash. Taken at Oakland, June 21.

75. *Dendrobias mandibularis* Serv. (*quadrimaculatus* Dup.)
Has been found commonly by Fall on the wing in early evening, about the willows along the Colorado River at Yuma in July. Found in Lower California. July 5.

76. *Lissonothus multifasciatus* Dup.
Found in Arizona; supposed also to be in vicinity of Yuma. Found in Lower California.

77. *Stenaspis solitaria* Serv.
Common at Cape San Lucas, Lower California.

78. *Tragidion annulatum* LeConte.
Found by Fall at Pomona, Pasadena, Lower California; by Van Dyke at Banning on mesquite; by Cottle at Upper Soda Springs, Shasta Co.; also by Van Dyke on South Fork of the King's River Canyon, Fresno.

79. *Tragidion armatum* LeConte.
Found by Van Dyke at Newhall, Los Angeles Co., sucking the sap of *Yucca whipplei*.

80. *Purpuricenus dimidiatus* LeConte.
Taken by Blaisdell at San Diego, by Van Dyke in Shasta Co., by Huguenon at Alma, Santa Cruz Co.

Found on Yerba Santa, locally called "Mountain Balm." July 12.

81. *Metaleptus angulatus* Chevrolat.
Found in desert region of Southern California.

82. *Amannus pectoralis* LeConte.
Location given as Yuma by LeConte.

83. *Batyle suturalis* Say.
Taken in numbers by author in latter part of May at Calistoga, Napa County. On Ceanothus flowers. May 28–June 27.

84. *Oxoplus marginatus* LeConte.
This and the following may be sexes. Found at San José del Cabo, Lower California.

85. *Oxoplus cruentus* LeConte.
Found at San José del Cabo, Lower California.

86. *Oxoplus jocosus* Horn.
Rare in the foothills near Pomona; found by Fall flying in day-time along the streams.

87. *Crossidius ater* LeConte.
Found in Nevada. Probably is also found in adjacent parts of California.

88. *Crossidius testaceus* LeConte.
Found at San Diego by Ricksecker, flying in September. Breeds on the roots of *Bigelovia arborescens*.

89. *Crossidius intermedius* Ulke.
Found in Los Angeles County on small, yellow-flowered plants.

90. *Crossidius discoideus* Say.
Taken by Coquillett in Mountains of Los Angeles County.

91. *Perarthrus vittatus* LeConte.
Found by Ricksecker at San Diego in September on the flowers of *Bigelovia arborescens*.

92. *Sphœnothecus suturalis* LeConte.
No data on this species.

93. *Sphœnothecus basalis* Horn.
Found at San José del Cabo, Lower California.

94. *Stenosphenus novatus* Olivier.
Found at San José del Cabo, Lower California. Several specimens were beaten from willow in July at Yuma by Fall.

95. *Cyllene antennatus* White.
Common in the deserts of Southern California, breeding in mesquite. Has been picked up on the streets of Los Angeles. Also bred by Van Dyke from mesquite brought to Los Angeles as fire wood.

96. *Cyllene crinicornis* Chevrolat.
Found in the deserts of Southern California. Have a specimen sent to me from Hololulu, T. H.

97. *Clytus lanifer* LeConte.
Found throughout the State, especially north of San Francisco and in the Sierras. Taken by Van Dyke on the flowers of *Eriogonum fasciculatum*. Abundant on the flowers of the chestnut oak in Sonoma Co. Also taken in the San Bernardino Mts. by Van Dyke. Taken by myself at Newcastle in July.

98. *Clytus planifrons* LeConte. [*Xylotrechus* in Henshaw-6189].
Found rarely north of San Francisco and in the Sierras. Bred by Rivers from dead branches of willow at San Francisco.

99. *Xylotrechus undulatus* Say.
Found in northern part of the State and in the Sierras. Breeds in *Pseudotsuga taxifolia* and probably other coniferous trees. Taken at St. Helena, Napa Co., by the author from cordwood of *Pinus ponderosa*. June 1–July 30.

100. *Xylotrechus insignis* Lec.—female. (*X. obliteratus* Lec.—male).
Breeds in various species of willow; found in all parts of State. There are two forms, one of them a southern form with much yellow pubescence.

101. *Xylotrechus annosus* Say.
Rare in northern part of State. Taken by author at Donner Lake in July. Taken by Van Dyke in Trinity County breeding in poplar.

102. *Xylotrechus nauticus* Mannerheim.
Found commonly throughout the State. Taken by Blaisdell and Van Dyke breeding in live oak; taken by Blaisdell and Pierson breeding in *Eucalyptus globulus* at San Diego and Berkeley, respectively. Also taken in Sonoma County by Ricksecker. June 2–Aug. 14.

103. *Neoclytus irroratus* LeConte.
Rare, but several have been found in Southern California. Taken at Pasadena by Dagget, at Santa Barbara by Fall, at Los Angeles, Mt. Shasta, and the south fork of the King's River Canyon by Van Dyke.

104. *Neoclytus conjunctus* LeConte.
Found in Northern California. Taken by Van Dyke breeding in manzanita and madrone; found by Kusche breeding in *Quercus douglasi* and *Fraxinus oregona*.

105. *Neoclytus muricatulus* Kirby.
Feeds on *Pseudotsuga taxifoliä* in the northern part of the State.

106. *Neoclytus balteatus* LeConte.
Rare, 2 taken in Shasta County, one by Cottle, one by Van Dyke; taken on manzanita. One taken by Van Dyke near the King's River, Fresno County, and one by Slevin near Monterey.

107. *Neoclytus interruptus* LeConte.
Found in Northern California. July 26.

108. *Neoclytus modestus* Fall.
Taken by Fall and Hopping at Pasadena and Kaweah, respectively.

109. *Neoclytus carus* Fall.
Found in the mountains near Pasadena by Fall, and at Santa Monica by Van Dyke.

110. *Neoclytus tenuiscriptus* Fall.
Taken by Fall at Pasadena and Claremont.

111. *Euderces parallelus* LeConte.
Found at San José del Cabo, Lower California.

112. *Callichroma cobaltinum* LeConte.
Found at Cape San Lucas, Lower California.

113. *Atimia confusa* Say.
This has been cited from California by Henshaw, but this is doubtful. (Teste Van Dyke).

114. *Atimia dorsalis* Le Conte.
Found mainly in the north and in the middle Sierras. Is found rarely at Riverside. Taken by Van Dyke breeding in post cedar.

115. *Desmocerus auripennis* Chevrolat.
Found from Mt. Shasta to Mt. Whitney in the high Sierras, breeding in mountain elderberry. Taken at Truckee in July by myself. July 7.

116. *Desmocerus cribripennis* Horn.
Found mainly in Coast Belt not more than several miles from the sea, as far south as Mt. Tamalpias. Breeds in red-berried elderberry trees. (Van Dyke).

117. *Desmocerus californicus* Horn.
Rare, found from Los Angeles north through the coast range to Marin County. Breeds in black-berried elderberry trees. (Van Dyke).

118. *Necydalis laevicollis* LeConte.
Found in Northern California. Bred from tan bark oak by H. C. Muzzall.

119. *Necydalis cavipennis* LeConte.
Found in Santa Cruz County, also on Russian River. Taken by Van Dyke in the North, and by Ricksecker in San Diego and Sonoma Counties.

120. *Necydalis barbaræ* Rivers.
Found rarely at Santa Barbara.

121. *Ulochætes leoninus* LeConte.
Found in Northern California and Sierras, also San Bernardino Mts. Bred from *P. ponderosa* by Van Dyke at Sissons and King's River.

122. *Pyrotrichus vitticollis* LeConte.
Found by Fuchs and Van Dyke breeding in the heartwood of alders about San Francisco Bay. May 29.

123. *Leptalia macilenta* Mannerheim.
Breeds in willow, found along the coast belt from

northern boundary to Santa Cruz. Taken at Oakland, November 2.

124. *Rhagium lineatum* Olivier.

Breeds in various pines. Found by Blaisdell breeding in yellow pine; by author on Jeffrey pine at Summit, Nevada County; by Slevin on Monterey pine at Monterey. Found north and throughout the Sierras. June 18–July 29.

125. *Centrodera nevadica* LeConte.

Taken by Fuchs near Lake Tahoe; by Blaisdell at San Diego; by Pilate in Tulare County; by Van Dyke in Trinity County, breeding in *Pinus ponderosa*.

126. *Toxotus vestitus* Hald.

Common in Northern California and throughout the Sierras. Found on flowers of wild hollyhock, azalea, lupine, etc. There are several colour varieties. Taken at Oakland, June 2.

var. *nubifer* LeConte.

var. *lateralis* Casey.

Taken at San Francisco.

127. *Toxotus flavolineatus* LeConte.

This is the western phase of *T. vittiger* Rand (=*T. trivittatus* Say). Found in the deep woods of the coast belt just north of San Francisco.

128. *Pachyta monticola* Rand.

Rare in the Sierras and north, probably feeds on spruce.

129. *Pachyta liturata* Kirby.

Found at high altitudes in the Sierras. Taken by Daggett on Mt. Whitney at elevation of 8,000–9,000 feet. Taken by Van Dyke at Mt. Shasta at elevation of 8,000 feet, breeding in fir.

130. *Pachyta spurca* LeConte.

Several specimens taken by Fall at Echo Mt., Southern California. Found by Van Dyke at Santa Monica. Breeds in *Pseudotsuga taxifolia*. It flys at night and is attracted to light. Is more common in the Sierras and north of San Francisco. July 13.

131. *Anthophilax tenebrosus* LeConte.
Rare in the Sierras, several specimens having been taken in Placer and Eldorado Counties. July 13.

132. *Acmæops pinguis* LeConte.
This is probably a variety of *A. tumida* LeConte.

133. *Acmæops tumida* LeConte.
Rare in Southern California; common in Central and Northern California on flowers, especially *Ranunculus californicus*, wild sunflower, wild hollyhock, etc. Taken by author at Oakland and Calistoga. June 1–November 7.

134. *Acmæops viola* LeConte.
Found in the extreme northern part of the State on flowers. Also taken at Calistoga by author. May 28.

135. *Acmæops vincta* LeConte.
Described from Montana, also taken in Oregon. Probably found in the extreme north of California.

136. *Acmæops basalis* LeConte.
Common in the middle of California and occasionally in the north on wild rose and certain umbelliferous plants. June 20.

137. *Acmæops militaris* LeConte.
Fairly common in parts of the extreme north of the State and in the Sierras. Taken in Sonoma County by Ricksecker. June 11–July 21.

138 *Acmæops falsa* LeConte.
Found by Daggett at Mt. Whitney, between the leaves of *Yucca whipplei*. Taken by Van Dyke in June on flowers, especially those of wild holly. Found also at Calmalli Mines, Lower California.

139. *Acmæops proteus* Kirby
Taken by author at Calistoga, June 1. Reported from Lower California.

140. *Acmæops pratensis* Laich.
Rare in Northern California and occasionally in the higher Sierras as far south as Mt. Whitney. More common in the North and in the Rockies.

(To be continued)

## ON THE VALIDITY OF *EUPITHECIA HARLEQUINARIA* DYAR.

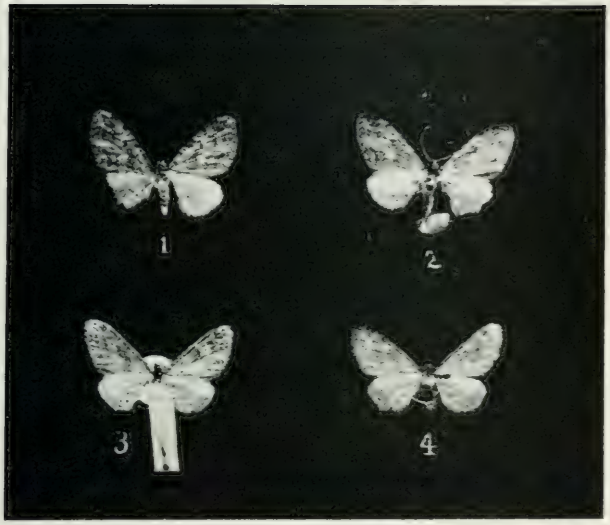
BY E. H. BLACKMORE, VICTORIA, B.C.

In the Check List of B. C. Lepidoptera, published by the Provincial Department of Agriculture in 1916, the late Rev. G. W. Taylor listed *Eupithecia harlequinaria* Dyar as a synonym of *bifasciata* Dyar. Later, in the Can. Ent., Vol. XVII, No. 3, p. 80, he says of *harlequinaria* that "one of the Victoria specimens passed through my hands and I have no hesitation in saying that it was merely a very brightly coloured, fresh specimen of *bifasciata*."

As I have been making a special study of the B. C. Geometrids for the past four years, I was naturally interested in the above remark. In 1914 I took a worn specimen of *Eupithecia* which was referable to *harlequinaria* as compared by me with one of the types which is in the Provincial Museum, Victoria, B.C.

In 1915 I took another specimen, which was in perfect condition and matches the type exactly. Through the kindness of Mr. J. W. Cockle, of Kaslo, who sent me three specimens of *bifasciata* I have been able to make a careful comparison of them, and I have no hesitation in saying that they are two distinct, and easily recognizable species, and that they are not liable to be confused one with the other. One of Mr. Cockle's specimens bears a label in his handwriting: "One of the original set from which Dyar's determination was made" and I presume that Mr. Cockle means that it is one of the short series that he had, from which Dr. Dyar selected the one which he made the type. However, it exactly fits Dr. Dyar's description of *bifasciata* (Proc. U. S. Nat. Mus., Vol. XXVII, p. 891). Dr. Dyar's description of *harlequinaria* (Proc. Ent. Soc., Wash., vol. 7, p. 29, 1905) is particularly good, and the specimen I took in 1915 fits the description in every particular.

Anyone reading the two descriptions together could not, by any stretch of the imagination, believe them to refer to the same species, and it is inconceivable to me that Dr. Dyar would describe the same insect twice in such a short space of time. The most striking difference between the two species is the presence, in *harlequinaria* of a large, bright, ochreous patch on the upper side of the primaries, running from the discal spot to fringe, and occupying the space between veins 3 and 4, overspreading each a




EXPLANATION OF PLATE III.

Fig. 1.—*Eupithecia harlequinaria* Dyar. Type specimen in Provincial Museum, Victoria, B.C. Taken by E. M. Anderson, May 20, 1903.

Fig. 2.—*Eupithecia harlequinaria* Dyar. Agrees with type, but is a perfect specimen. Taken at Victoria, B.C., by E. H. Blackmore, May 2, 1915.

Fig. 3.—*Eupithecia bifasciata* Dyar. One of the short series from which Dyar selected his type. Taken at Kaslo, B.C., by J. W. Cockle, June 7, 1903.

Fig. 4.—*Eupithecia bifasciata* Dyar. Agrees with Fig. 3. Taken at Kaslo, B.C., by J. W. Cockle, June 17, 1907.

little. It is an irregular oval patch, measuring approximately 5 mm. in breadth by 2 mm. in depth. This at once distinguishes it from any other *Eupithecia* known to me.

The broad, whitish band at the outer third, which is a distinguishing feature of *bifasciata* is not present in *harlequinaria*. Apart from the difference in maculation, they also differ in time of emergence. My two specimens of *harlequinaria* were taken May 2nd, 1915, and May 22nd, 1914, (worn), respectively, and the type in the Provincial Museum bears a label in Dr. Dyar's handwriting: "20th May, 1903." The three specimens of *bifasciata* from Mr. Cockle bear dates June 7th, 1903; June 17th, 1907; and July 3rd, 1910, and Dr. Dyar's types were June 13th and 25th, so that it is quite evident that there is a full month's difference in the time of their appearance.

Further I have no record of *bifasciata* being found west of the Cascade Range, and all the specimens of *harlequinaria* that I know of, have been taken on the immediate coast. As regards the latter species it must be exceedingly rare, as I can find no record of any specimens being taken at Victoria between those taken by Mr. E. M. Anderson in 1903, and the two that I captured in 1914 and 1915. I have seen all the chief collections in Vancouver and on Vancouver Island, but none of them contain any specimens of *harlequinaria*.

In conclusion I think that I have adduced enough evidence to prove conclusively that *harlequinaria* and *bifasciata* are two distinct species.

Author's Note.—This article was written eighteen months ago, but was accidentally mislaid and only recently found. I wrote to Messrs. Barnes and McDunnough, pointing out these differences about a year ago, and they have listed them as distinct species in their new Check List.

## BOOK NOTICE.

Field Book of Insects—By Frank E. Lutz, Ph. D., Associate Curator, Dept. of Invertebrate Zoology, American Museum of Natural History. Pp. 509. About 800 illustrations, many in colour. G. P. Putnam's Sons, New York and London, 1918. $2.50.

This is a companion to the Field Book of Wild Birds and their Music, Field Book of American Wild Flowers and Field Book of American Trees and Shrubs, and its aim is to give the kind of

information about insects usually sought by the laity, with whom the author, in connection with his museum work, has long been in close contact. Its usefulness, however, does not stop here, for it will prove invaluable to every young entomologist and serviceable even to those of experience. It contains a great deal of information within a small compass, and although necessarily much condensed it is written in simple language as free as possible from technical terms.

The first 38 pages contain brief sections of an introductory nature on the system, growth and structure of insects, longer discussions on collecting and mounting, and on the control of injurious forms, and on insect-like Arthropods, particularly spiders. The rest of the book treats of the various orders and families, with brief accounts of the commoner or more striking species found in the Northeastern United States. Particular attention is given to such forms are are commonly observed by the layman, such as the larger, more conspicuous or more injurious species, but some notice is taken of nearly all the families. Thus we find that a relatively large space is given, and quite properly so, to the butterflies and larger moths and to some of the beetles. The long-horned beetles, however, receive somewhat more than their share of space, there being a key to the species extending over nearly twenty pages. There are a number of other keys to families and genera and in some cases species, and among the latter is a useful one to the commoner kinds of Muscid flies, which is followed by brief descriptions of the characters and habits of the more important species and of the methods of combatting these dangerous insects. There is also a special section at the end of the book on galls, which is illustrated by a large number of figures.

The illustrations form a most attractive feature of the book. Almost 700 of the entire number are the work of Mrs. E. L. Beutenmuller, who deserves great credit for the faithful manner in which she has performed an enormous task. Some of the coloured plates have suffered in the reproduction but most of them are satisfactory and the black-and-white figures are almost uniformly excellent. Nearly 600 species are illustrated by one or more figures.

We heartily recommend this admirable work to every young entomologist and outdoor naturalist.

Mailed June 5th, 1918.

The Canadian Entomologist.

Vol. L. LONDON, JULY, 1918 No. 7

## POPULAR AND PRACTICAL ENTOMOLOGY.

### Popilia japonica Newm., a Recently Introduced Japanese Pest.

BY EDGAR L. DICKERSON AND HARRY B. WEISS, NEW BRUNSWICK, N.J.

While inspecting a nursery in Southern New Jersey during the middle of August, 1916, the attention of the writers was attracted by a scarabæid feeding on the tips of Cratægus. Specimens were collected, and inasmuch as it was assumed to be a southern species, no particular attention was paid to it at that time. Recognizing, however, that it was new to New Jersey, specimens were recently sent to Mr. H. S. Barber and identified by him as *Popilia japonica* Newm. Mr. Barber stated that our specimens seemed to agree satisfactorily, even in the female genitalia, with the series of Japanese specimens in the collection of the United States National Museum. He also stated that this was the first record of the genus from America, and further that species in allied genera have caused considerable trouble in the Old World and when introduced into various of the Pacific Islands.

On July 31, soon after receiving this information, the nursery was visited and the beetles found to be present. They were especially abundant on weeds in one corner of the nursery, and to a lesser extent on adjoining nursery stock. On August 8, 1917, the nursery was again visited for the purpose of determining the exact status of the insect. At this time a considerable area was scouted and the following conditions observed. The beetles were found to be extremely abundant on weeds growing along one side of the nursery and extending at one point for a few feet into an adjoining orchard and along one side of the orchard away from the nursery and for a couple of hundred yards beyond. The infested area was small but the beetles numerous, and the line of spread appeared to have followed the weeds. At several places the insects were found on nursery stock, in most cases not far from the heavily infested weeds.

The feeding appears to be somewhat like that of the rose chafer and other scarabæids, but the destruction of the foliage is much more complete. Smartweed (*Polygonum virginianum*), tearthumb (*Tiniaria arifolium*) both belonging to the *Polygonaceæ*, evening primrose (*Oenothera biennis*), Virginia creeper (*Ampelopsis quinquefolia*), a member of the Vitaceæ, were the principal food plants among the weeds, and in some cases the leaves of these plants were completely riddled. Other weeds infested to a less extent were ragweed (*Ambrosia* sp.), velvet leaf or Indian mallow

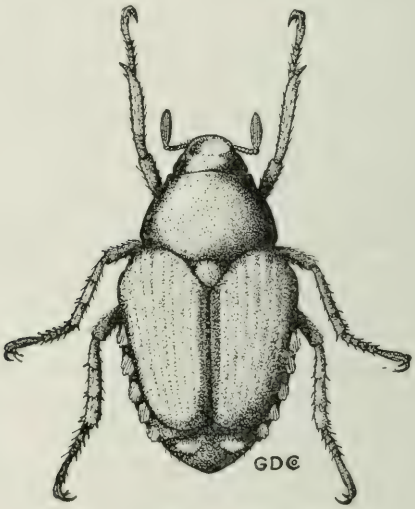



Fig. 9.—*Popilia japonica* Newm.

(*Abutilon avicennæ*), jewel weed (*Impatiens* sp.) and the blossoms of milkweed (*Asclepias syriaca*). In the nursery the beetles were found feeding on the foliage of *Ampelopsis quinquefolia*, flowering cherry, grape, elder, Crataegus, button bush, and in or on the flowers of double Althea, Spirea and *Vitex agnus-castus*. They were especially abundant on the foliage of the first three plants, and sometimes four or five were found buried in the double Althea flowers. On the smartweed as many as a dozen were found on single leaves. It was interesting to note that in the nursery, the beetles had apparently passed over the flowers and foliage of hydrangia and the foliage of Deutzia, peony and some other

plants and infested Althea blossoms and *Ampelopsis* foliage further away. Alfalfa, corn, tomatoes, pears in adjoining fields and cowpeas and pole beans in the nursery were uninfested, although the beans were close to the infested weeds. Smartweed in the midst of the cowpeas and tomatoes was badly eaten. The insects were found occasionally resting on other plants such as *Tamarix africana* in the nursery and corn silk in the field, but no feeding could be detected.

When disturbed during the heat of the day, the beetles would partly fall and fly off in a clumsy manner with a slight buzzing sound. On the whole they were quite active. Late in the day they were less active and would fall to the ground when disturbed. A number were noted in the attitude of copulation, but very few were found in copulo.

Mr. C. H. Uchida was kind enough to translate accounts of this insect as given in two Japanese text books. The first one is that given by S. Matsumura in his "Japanese Insect Pests," part 2, p. 247. He states that the beetles do considerable damage to string beans, grapes and certain wild beans; that the adults emerge in June and remain until September; that they are attracted by lights and controlled by hand picking and spring and fall plowing. The other account is that given by A. Fukatani in "Practical Methods of Destroying Insects on Horticultural Plants," p. 325. Mr. Fukatani gives the following account: The species feeds on string beans, peas, grapes and peanuts, the larvæ being found in the soil on the roots. The eggs are milky white, elliptical and about one-sixteenth of an inch in length. The larva is a characteristic white grub about three-fourths of an inch long, milky white, with a yellowish brown head. The pupa is about one-half inch in length, yellowish, covered with short hairs. The larva winters in the soil and pupates in May or June, the beetles emerging in July. Eggs are deposited singly in the soil and the larvæ moult several times before winter, the complete life cycle requiring one year. He also states that control is effected by jarring the beetles off the plants into a dish of oil and water; by jarring them from trees to a cloth spread below; by spraying with Paris green, lime and water; Paris green and Bordeaux mixture and by the use of Vaporite

in the soil, also that the use of organic manure and especially compost should be avoided.

From these two accounts it is evident that *Popilia japonica* is regarded as a pest in Japan. It was probably introduced into New Jersey in the larval stage in the soil around iris roots imported from that country. Japanese iris roots were first planted in the nursery where the infestation occurred about six years ago, and there have been two or three plantings of similar stock since that time. Azaleas imported from Japan have also been planted in this block but not previous to two years ago. Judging from the number of beetles observed, the insects must have been present more than two years. That it was not noticed sooner is due to the fact that its feeding is largely confined to weeds as has been stated. Its rate of dispersal is apparently very slow, as at the present time its feeding in the nursery is confined largely to that part where it apparently originated, and in the weeds outside of the nursery along the road it has not extended more than a few hundred yards. The fact that its rate of dispersal is slow is fortunate since if it became widely distributed it might become a serious pest on plants of the family *Polygonaceæ* such as buckwheat, and of the family *Vitaceæ*, such as grapes and perhaps on plants of other families such as cherry, etc.

While the Japanese account states that this insect infests leguminous plants, it is interesting to note that these plants remained uninfested although other plants in their midst were badly eaten, as has been mentioned above. The infestation in New Jersey is under careful observation; infested weeds and nursery plants are being treated with arsenic supplemented by hand picking. In this connection, it is interesting to note that where Ampelopsis was sprayed with arsenate of lead, the plants were practically free from the beetles, although previous to the spraying they were badly infested. No dead beetles were observed on the ground under the sprayed plants, but after careful observation it was found that some of both sexes had burrowed several inches into the soil under the infested plants. These beetles were very sluggish and had apparently been affected by the poison.

The beetle can be recognized from the following brief description: It measures a little less than one-half inch in length

and is similar in shape to species of *Euphoria*. The body and legs are metallic, bronze green in colour, save for the elytra which are reddish brown with dark margins. The lateral margins of the abdomen bear single tufts of conspicuous yellowish white hairs on each segment and a pair of these tufts on the exposed dorsal surface of the last segment. Each tuft extends downward forming a transverse line on the ventral surface, which becomes obsolete in the central portion. The ventral surface of the thorax and the basal segments of the legs are conspicuously hairy.

## NOTES ON COCCIDÆ (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

It is the belief of the present author that more may now be accomplished by the redescription of many of our named species of Coccidæ than by the addition of new forms. Especially is it desirable that the types of many of the non-Diaspine genera be elucidated for the existing descriptions are, in certain cases, so inadequate that only the most vague and unsatisfying conception can be formed from them of the real character of the genera which they typify. Nor will the mere redescription of these forms in terms of the methods heretofore so generally employed by certain authors be sufficient. There must be an accompanying search for characters of real significance. Confidence in the all-sufficiency of the number of antennal segments and the character of the secretions as taxonomic criteria can no longer be maintained.

The present paper, therefore, is the first of a proposed series in which redescriptions of and notes upon the more interesting and more significant species available for study will be presented. Throughout these papers no references other than to the Fernald Catalogue and its supplements will be given, except in the case of some which may not be found therein.

### Genus Cryptokermes Hempel.

1903. Fernald, Catalogue of the Coccidæ, p. 88.

Monophleboid Coccidæ in which the adult female is entirely without legs or antennæ (and possibly without mouth-parts), remaining enclosed within the derm of the penultimate stage; penult-

imate stage with an anal tube which is formed by the chitinization of the posterior portion of the anal ring and not by the invagination of the posterior portion of the abdomen, with short, stout legs and antennæ and with mouth-parts; first larval stage in general resembling the first stage of Icerya, with slender, six-segmented antennæ, a well-developed anal tube, and with a series of long, slender setæ along the posterior margin of the body; all stages with six pairs of abdominal spiracles.

Type of the genus, *Cryptokermes brasiliensis* Hempel.

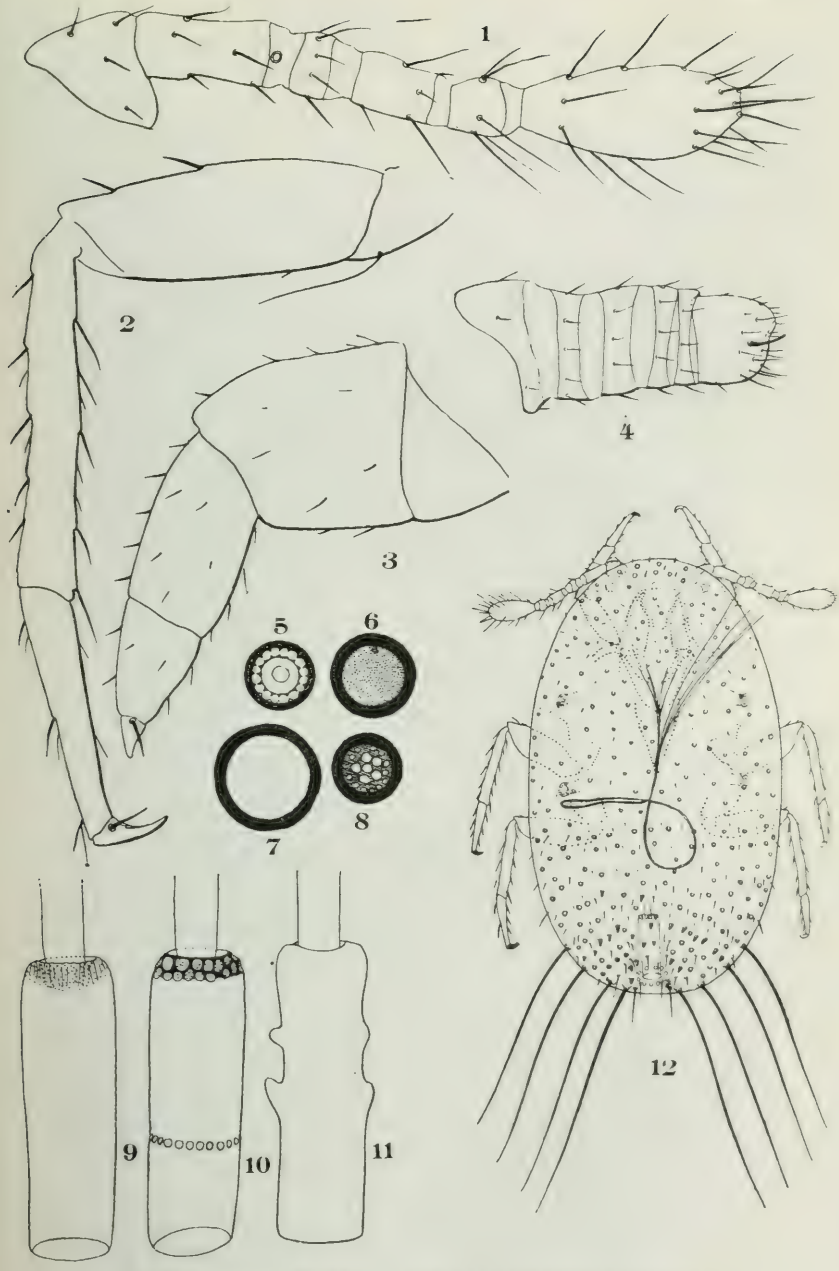
*Notes on the genus.*—In the Fernald Catalogue this genus is referred to the subfamily Dactylopiinæ, and is placed between *Ourococcus* and *Sphaerococcus*, apparently because of Cockerell's statement (1902) that "It is now clear that the genus is related to the Australian *Sphaerococcus* and *Ourococcus*." The real nature of the genera mentioned cannot well be determined from the existing descriptions, but it is fairly evident that *Cryptokermes* is related to neither of them. It is, in fact, unmistakably a Monophleboid form, the presence of the abdominal spiracles alone being sufficient evidence of this. I may say that in this opinion Mr. E. E. Green concurs.

The exact affinities of the genus are somewhat in doubt. The first stage larva is distinctly Icerya-like, while the intermediate stages are very similar to Xylococcus except for the presence of the short legs and antennæ. The absence of legs and antennæ in the adult female is unique in this group, although by no means uncommon in the Coccidæ.

### **Cryptokermes brasiliensis** Hempel.

1903. Fernald, Catalogue of the Coccidæ, p. 88.

*Adult female.*—Length (flattened on slide) 5 mm. Derm membranous except for a large area of the dorsum (and possibly a portion of the venter) at the anterior end of the body, which is heavily chitinized. The eyes appear as two light spots in this chitinized area, which is thickly beset with short, spike-like spines. Remainder of the body sparingly beset with short, slender setæ, except about the vaginal orifice where the setæ are longer and more numerous. Dermal pores of the types shown in Fig. 5. The anal tube of the penultimate stage (in my specimens at least)




CRYPTOKERMES BRASILIENSIS Hempel.

(See p. 225.)

remains within the body of the adult female. Spiracles large and distinct.

The absence of mouth-parts may be apparent only, as they may possibly be obscured by the heavy chitinization of the anterior portion of the body.

*Penultimate stage.*—Length (flattened on slide) 4.5 mm. Globose in form. Derm everywhere quite heavily chitinized, especially toward the posterior portion of the body, and everywhere beset with many short, spike-like spines. Antennæ (Fig. 4) short and stout, six-segmented. Legs (Fig. 3) short and stout. Mouth-parts well developed, with a mentum present. Anal tube (Fig. 11) very heavily chitinized, its details not discernible in my specimens. In the specimens at hand the anal tube of this stage remains at the final ecdysis within the body of the adult female, a circular area of the derm of the penultimate stage surrounding the base of the tube remains attached to it, breaking away from the shed derm of this stage, and thus leaving an opening through which the eggs or larvæ probably escape. Dermal pores of the types shown in Figs. 6, 7 and 8, the type shown in Fig. 7 being merely a more or less irregular chitinized ring.

*Second* (?) *stage.*—Except for the unchitinized derm and the presence of but few spines, resembling the penultimate stage. The anal tube (Fig. 10) chitinized only at the inner end.

*First stage.*—In general much resembling an Icerya larva (Fig. 12). Antennæ (Fig. 1) 6-segmented, slender and presenting a clavate appearance, bearing numerous short hairs. Legs (Fig. 2) slender. Posterior end of the body with a series of eight long, slender setæ. Derm beset with many pores of the type shown in Fig. 6 and with a few pores of the type of Fig. 8, also with many short, slender setæ and toward the posterior end of the body with short, tubercle-like spines. Anal tube well developed, chitinized only at the inner end.

*Material examined.*—Specimens in the Stanford collection from *Mimosa* sp., Zapotlan, Mex., C. H. T. Townsend collector. Received from T. D. A. Cockerell and evidently a portion of the material recorded by him in 1902.

*Notes on the species.*—The adult female has not heretofore been described, that which both Hempel and Cockerell described

as this stage being in reality the penultimate stage. The form described by Cockerell as the first stage larva of this species is probably either incorrectly described or does not belong with this species, for he speaks of the presence of "figure-of-eight" pores and of projecting anal lobes. The form described by him as the second stage is what I here consider to be the first stage.

EXPLANATION OF PLATE IV.

**Cryptokermes brasiliensis** Hempel.

Fig. 1. Antenna of first stage larva.
Fig. 2. Leg of first stage larva.
Fig. 3. Leg of penultimate stage.
Fig. 4. Antenna of penultimate stage.
Fig. 5. Dermal pore of adult female.
Fig. 6. Dermal pore of first stage and succeeding larval stages.
Fig. 7. Dermal pore of second (?) and penultimate stages.
Fig. 8. Dermal pore of larval stages.
Fig. 9. Anal tube of first stage larva.
Fig. 10. Anal tube of second (?) stage larva.
Fig. 11. Anal tube of penultimate stage.
Fig. 12. First stage larva.
*Note.*—Antennæ and legs only drawn to uniform scale.

## THE HEATH COLLECTION OF LEPIDOPTERA.

(Continued from Vol. XLIX, p. 92.)

BY J. B. WALLIS, WINNIPEG, MAN.

The Geometridæ were, in cases of doubt, submitted to Mr. A. F. Winn or to Drs. Barnes and McDunnough.

In all the following species it was considered advisable to give the changes as indicated by the new check list. But as it is improbable that the collection will be re-arranged for a considerable period; the order of the species in the collection, that is, of the Smith list, is adhered to. The names in brackets are those given in Drs. Barnes and McDunnough's list.

### Geometridæ.

3504 *Nyctobia nigroangulata* Strck.
3508 *Rachela bruceata* Hulst. Rare in Manitoba.

3513 *Paleacrita vernata* Peck.
3515 *Alsophila pometaria* Harr. Rare in Manitoba.
3516 *Eudule mendica* Wlk.
3524 *Talledega* (*Lobophora*) *tabulata* Hulst.
3545 *Tephroclystis* (*Eupithecia*) *ornata* Hulst.
3546 " " *miserulata* Grt.
3563 " " *absinthiata* Clerck. Not North American according to the new list.
3591 *Tephroclystis* (*Eupithecia*) *ravocostaliata* Pack.
3595 *Eucymatoge* (*Eupithecia*) *anticaria* Wlk.
3599 " (*Horisme*) *intestinata* Guen. A badly worn specimen of this stood as "*vitalbata*."
3604 *Euchoeca* (*Trichodesia*) *albovittata* Guen.
3606 " (*Eupithecia*) *cretaceata* Pack.
3608a " (*Hydrelia*) *brunneifasciata* Pack.
3612 *Hydria* (*Calocalpe*) *undulata* Linn.
3620 *Eustroma* (*Lygris*) *diversilineata* Hbn.
3621 " " *testata* Linn. Stood as "*populata*."
3622 " " *propulsata* Wlk. Stood as "*testata*."
3623 " " *destinata* Moeschl. var.
3624 " " *triangulata* Pack. Stood as "*destinata*."
3628 " " *cunigerata* Wlk.
3631 *Rheumaptera* (*Eulype*) *hastata* Linn.
3632 " (*Epirrhöe*) *tristata* Linn.
3633 " " *sociata* Bork. (*alternata* Mull.)
3642 *Percnoptilota* (*Orthonama*) *fluviata* Hbn. (*obstipata* Fab.)
3643 *Mesoleuca ruficillata* Gn.
3646 " (*Xanthorhöe*) *lacustrata* Gn.
3648 " (*Euphyia*) *intermediata* Gn. Stood in part as *Cymatophora flavicaria* and what are apparently badly worn specimens of this as *Xanthorhöe montanata*.
3651 *Mesoleuca* (*Dysstroma*) *truncata* Hufn.
3655 " " *hersiliata* Gn.
3659b *Hydriomena nubilofasciata* Pack.
3660 " *autumnalis* Strom. (*cærulata* Fab.)
This and the preceding stood as *Mesoleuca hersiliata*.
*Hydriomena ruberata* Frey.
3663 " *californiata* Pack.

3665 *Hydriomena reflata* Grt.
3673 " (*Euphyia*) *multiferata* Wlk.
3674 " (*Euphyia*) *latirupta* Wlk (*centrostrigaria* Woll.) Stood as *Xanthorhöe ferrugata* and *munitata*.
3689 *Triphosa hæsitata* Gn. Correctly and also as *dubitata*.
3710 *Gypsochroa* (*Xanthorhöe*) *designata* Hufn.
3731 *Xanthorhöe munitata* Hbn.
3732 " *ferrugata* Clerck. Stood as *munitata*.
3743 *Hæmotopis grataria* Fab.
3751 *Mycterophora slossoniæ* Hulst. (*inexplicata* Wlk.)
3752 *Deptalia insularia* Gn. (*Pleuroprucha insulsaria* Gn.)
3755 *Cosymbia lumenaria* Hbn.
3762 *Synelys ennucleata* Gn. (*Ocidalia enucleata* Gn.)
3769 *Xystrota hepaticaria* Gn.
3772 *Cinglis similaria* Wlk. ("Probably" McD.) (*Cabera erythemaria*.)
3773 *Cinglis* (*Acidalia*) *purata* Gn.
3775 " " *ancellata* Hulst. "Apparently" McD.
3786 *Leptomeris* (*Holarctias*) *sentinaria* Geyer. Stood as *magnetaria*.
3820 *Eois persimilis* Hlst. (*Acidalia junctaria* Wlk.).
3821 " (*Ptychopoda*) *inductata* Gn.
3834 *Annemoria* (*Cheteoxelis*) *bistriaria* Pack.
3841 *Nemoria* (*Chlorissa*) *subcroceata* Wlk.
3845 *Eucrostis* (*Mesothea*) *incertata* Wlk. In the series with the preceding.
3857 *Synchlora denticularia* Wlk. Stood as *liquoraria*.
3864 *Chlorosea* (*Memoria*) *mimosaria* Gn.
3881 *Epelis faxonii* Minot. (*Isturgia amitaria* Gn.).
3882 *Eufidonia notataria* Wlk.
3883 *Orthofidonia exornata* Wlk. (*tinctaria* Wlk.).
3884 " (*Bapta*) *semiclarata* Wlk.
3885 " " *vestaliata* Gn.
3896 *Gueneria basiaria* Wlk. Stood as *Deilinea erythremaria*.
3897 *Deilinea* (*Cobera*) *borealis* Hulst.
3900 " " *variolaria* Gn.
3926 *Sciagraphia* (*Macaria*) *granitata* Gn.
3927 " " *denticulata* Grt.

3940 *Sciagraphia* (*Phasiane*) *meadiaria* Pack. Stood as *continuata*.
3943 " (*Phasiane*) *mellistrigata* Grt.
3946 *Philobia enotata* Gn. (*æmulataria* Wlk.).
*Macaria* (*Phasiane*) *ordinata* Wlk.
3969 *Cymatophora* (*Itame*) *ribearia* Fitch.
3970 " " *sulphurea* Pack.
3971 " " *occiduaria* Pack.
3989 " " *pustularia* Hbn.
4015 " " *inquinaria* Hulst. (*quadrilinearia* Pack.).
4027 *Sympherta julia* Hulst (*Dysmigia loricaria* Evers).
4068 *Alcis* (*Hesperumia*) *sulphuraria* Pack.
4608a " " *baltearia* Hulst.
4090 *Paraphia subatomaria* Wood.
4138 *Cleora indicataria* Wlk.
4140 " *pampinaria* Gn.
4145 " *larvaria* Gn.
" *takenaria* Pears. (*ephyraria* Wlk.).
4148 *Melanolophia canadaria* Gn.
4153 *Ectropis crepuscularia* Schiff. Stood as *Cleora inductaria* and *Sabulodes umbrosarium*.
4156 *Lycia ursaria* Wlk.
4158 " (*Amphidasis*) *cognataria* Gn.
4164 *Nacophora quernaria* S. & A.
4175 *Erannis tiliaria* Harris.
4177 *Cingilia catenaria* Dru.
4182 *Dyscia orciferata* Wlk. (*Aspilates orciferaria*).
4189a *Anagoga occiduaria* Wlk.
4193 *Sicya macularia* Harr.
4202 *Therina* (*Ellopia*) *fiscellaria* Gn.
4206 *Metrocampa prægrandaria* Gn. (*Campæa perlata* Gn.).
4209 *Eugonobapta nivosaria* Gn.
4216 *Ennomos magnarius* Gn.
4218 *Xanthotype crocotaria* Fab.
4218a " *cælaria* Hulst.
4224 *Plagodis phlogosaria* Gn. probably.
4227 *Hyperetis amicaria* H. S.
4232 *Ania limbaria* Haw. (*Nematocampa limbata* Haw.).

4236 *Gonodontis duaria* Gn. Stood in part as *warneri*.
4247 *Euchlæna obtusaria* Hbn.
4248 " *effectaria* Wlk. (*effecta* Wlk.). Mixed with *obtusaria*.
4251 *Euchlæna johnsonaria* Fitch.
4254 " *astylusaria* Wlk. Probably. This was under *marginata* and *amoenaria*.
4255 *Euchlæna marginata* Minot. Mixed with *pectinaria*.
4256 " *pectinaria* D. & S.
4261 *Eutrapela* (*Selenia*) *alciphearia* Wlk.
4272 *Metanema inatomaria* Gn.
4273 " *determinata* Wlk.
4281 *Priocycla armataria* H. & S.
4292 *Azelina ancetaria* Hbn. (*Pero honestarius* Wlk.).
4299 *Caberodes* (*Apicia*) *confusaria* Hbn.
4300 " " *majoraria* Gn. = *confusaria*, according to the new list.
4304 *Tetracis crocallata* Gn.
4307 *Sabulodes arcasaria* Wlk.
4309 " *lorata* Grt.
4319 " *transversata* Dru.
4321 *Abbotana clemataria* S. & A.
4330 *Brephos infans* Moeschl. One only.
4333 *Leucobrephos brephoides* Wlk.

**Epiplemidæ.**

4336 *Callizzia amorata* Pack.

(To be continued.)

## NEW SPECIES OF MICROLEPIDOPTERA.

BY ANNETTE F. BRAUN, CINCINNATI, OHIO.

HELIODINIDÆ.

**Erineda aenea,** n. sp.

Palpi and face pale buff, head yellowish, slightly purplish opalescent or brownish in the female. Basal segment of antennæ yellowish, stalk clothed with dark brown scales, except the last six or seven segments which are white. Antennæ of male with long, sparse ciliation in the basal half, with short cilia in the apical half. Thorax purplish opalescent. Fore wings dark golden brassy,

becoming darker towards apex. A velvety dark brown spot at base of costa is surrounded by opalescent purple, which gradually fades into the ground colour. The purplish opalescence is less noticeable in the female. Hind wings brownish brassy. Hind tibiæ bright yellow, with upper edge and spines orange-tinged, apex black; hind tarsi blackish above, whorls of spines yellowish. Abdomen concolorous with hind wings at base, dark brown toward tip, anal tuft in male yellowish.

Expanse 8–9 mm.

Localities.—Cincinnati, O.; Clermont Co., O.

Type and two paratypes in author's collection.

This species may be distinguished from *E. elyella* Busck by the larger basal brown spot, much darker colour, with absence of dorsal light streak, and by the different antennal coloration and structure.

The larvæ feed on the spores of two species of ferns, the narrow-leaved spleenwort (*Asplenium angustifolium*) and the silvery spleenwort (*A. acrostichoides*). A web, beneath which the larva feeds, is spun along the underside of the leaflet, often extending for three-fourths its length by the time the larva reaches maturity. When young the larva mines into the sorus, eating out the greater portion of the spores and leaving the indusium hollow. Later the larva becomes too large to mine and consumes the entire sorus, except the annuli of the sporangia, in many places leaving only the ridge along which the indusium was fastened to the leaf, indicating perhaps that this is also consumed in addition to the spores. Near the beginning of the web, and to one side of the midrib, a circular opening leads to the upper side. Protecting the opening on the upper side, and broadest and thickest just over the opening, is a tubular web tapering and crossing the midrib diagonally. It is somewhat raised at the beginning, but flattens toward its narrow end, where there is an opening through which the larva ejects the frass. On the underside of the leaf, the web is also thickest over the circular hole. The web is decorated with the innumerable rejected annuli of the sporangia, which cover closely those portions around the circular opening, both on the upper and under surfaces of the leaf, thus affording protection to the larva when not feeding. The larva while feeding is yellowish

white with slightly darker head and prothoracic shield; at maturity it turns to a bright vermilion orange colour. It spins a double cocoon of very fine, white silk, broadly oval, with one end a little more pointed, the inner cocoon more elongate than the outer.

The larvæ may be found in September; the exact time of reaching maturity depends upon the time of spore production in the ferns. *Asplenium acrostichoides* produces fertile fronds and ripe spores a couple of weeks in advance of *A. angustifolium*. Where both species of ferns occur together, full-grown larvæ may be collected on the former species when the larvæ on the latter have eaten but one or two sori on each side of the midrib. The imagos emerge during the latter part of July and early August.

In repose the moth rests with the brightly coloured hind legs raised above the body.

YPONOMEUTIDÆ.

**Argyresthia pallidella,** n. sp.

Palpi pale yellowish white, fuscous beneath. Face and head yellowish white, tuft almost white, antennæ grayish yellow, annulate with dark brown. Thorax and fore wings pale shining yellowish white; extreme costa in the basal fourth dark brown. Cilia whitish. Hind wings very pale gray or concolorous with the fore wings, cilia whitish. Legs whitish, tibiæ and tarsi of the first pair fuscous. Abdomen brownish yellow at base, gray behind except tip, which is whitish yellow.

Expanse 11 mm.

Locality.—San Barnardino Mts., California, July 7.

Type and paratype in author's collection.

The specimens were collected amongst fir, which is perhaps the food plant. This species is very similar to *A. laricella* Kearf, the chief difference being the darker annulated antennæ.

**Swammerdamia cuprescens,** n. sp.

Head and face white; palpi white with fuscous under surface; basal segment of antenna white, stalk dark fuscous, annulate with pale gray. Thorax white, very sparsely sprinkled with pale gray specks. General colour of the fore wing pale gray, due to gray-tipped whitish scales, with the base of the wing somewhat darker gray. There is a dark gray half-crescent-shaped mark situated at the basal third of the dorsum, curving slightly outwards and

not reaching the costa. There are some longitudinal series of dark fuscous spots lying chiefly near the costa and dorsum. At the beginning of the cilia is a white costal spot; beyond it the apical portion of the wing is dark fuscous, the fuscous shade usually extending downward to the dorsum. Cilia dark with a coppery lustre and a dark fuscous line through the middle. Hind wings pale gray, closely irrorated with fuscous. Legs pale gray; tibiæ and tarsi of the first pair and tibiæ of the second pair dark fuscous; tarsal segments tipped with fuscous. Abdomen gray.

Expanse 12.5–13.5 mm.

Locality.—Field, B.C.

Type and two paratypes in author's collection; one paratype in the collection of the Entomological Branch, Department of Agriculture, Ottawa.

Four specimens bred from larvæ in webs on birch (*Betula glandulosa*), Field, B.C. Larvæ were also collected on alder at Glacier, B.C., but no moths were reared. Larvæ collected in August, pupated in a few days, and the moths appeared in the breeding jars in April and May of the following year.

This species differs from the European *S. heroldella*, also a birch feeder, by the distinct coppery lustre of the cilia.

**Xyrosaris ochroplagiata,** n. sp.

Palpi white with under surface irrorated with blackish, except towards apex. Face dusted; head pure white; antennæ white with fuscous annulations. Thorax white slightly dusted. Base of wings irrorated with fuscous-tipped scales, blackish toward costa; beyond this is a pale ochreous, almost undusted area, extending obliquely from costa to dorsum, and broadening toward the dorsum, occupying approximately one-fourth the wing area; remainder of the wing covered with more or less deeply fuscous-tipped white scales, mingled with patches of whitish and ochreous. Immediately following the basal ochreous area, near middle of dorsum is a small, curved, white streak, margined outwardly with a patch of scales, darker tipped than general over the wing. A similar dark patch on costa opposite. A white costal spot at beginning of cilia. Several rows of very minute tufts of black scales; immediately below costa, along middle of wing, just above fold, and one or two of a fourth row below fold on outer half of wing; the largest tufts

are those at the basal third and above the tornus belonging to the row above the fold. Cilia ochreous, with a line of dark-tipped scales. Hind wings gray, with a faint ochreous tinge; cilia gray, ochreous at extreme bases. Fore and middle legs closely irrorated with fuscous, hind legs sparsely speckled. Abdomen gray, margins of segments whitish.

Expanse 11.5 mm.

Locality.—Winnfield, La., June 26 (G. R. Pilate).

Type in author's collection.

GRACILARIIDÆ.

**Acrocercops affinis,** n. sp.

Palpi with whitish ground colour more or less obscured with fuscous dusting; second segment of labial palpus white on the under surface, elsewhere fuscous; third segment whith the base white followed by a narrow, blackish annulus which is succeeded by a narrow whitish annulus, remainder of segment fuscous. Antennæ fuscous faintly paler annulated. Head whitish more or less densely streaked with fuscous. Fore wings brownish fuscous, dusted, marked with a series of ten transverse whitish strigulæ, the first eight equidistant, the last two in the apical cilia; these strigulæ are most distinct on the costa, obsolete or ill-defined where they cross the middle of the wing, and ending in whitish spots on the dorsum. The first streak is usually nearly obsolete; the fourth ends in a whitish blotch on the dorsum; the seventh is more oblique and more clearly defined in the middle of the wing than the preceding ones; the eighth encloses the apex. The fifth streak on the costa is sometimes double. The ground colour is more or less darkened on the margins between the streaks, especially between the fourth and fifth, and sixth and seventh costal streaks; and between the second and third, and fourth and fifth dorsal streaks. Hind wings and cilia gray. Legs whitish banded with fuscous. Abdomen gray.

Expanse 9.5–10 mm.

Localities.—Yosemite National Park, California; San Bernardino Mts., California.

Types in author's collection.

A large series bred from upper side blotch mines on oak, both deciduous and evergreen. The mine starts as a narrow, white

line, expanding abruptly into a large, white blotch, within which the parenchyma is to a large extent consumed. Cocoon oval, brownish, ornamented with a few whitish globules. Larvæ collected June 20 (San Bernardino Mts.); July 26 (Glacier Point, Yosemite), at which time they were nearly full grown, produced imagos in about two weeks.

Closely allied to *A. strigosa*, from which it differs by having the transverse lines broken and less distinct and a little more irregularly placed.

**Ornix spiraeifoliella,** n. sp.

Palpi grayish white, face grayish white, tuft of gray and whitish scales intermixed, antennæ gray, faintly annulate. Thorax and fore wings uniform shining seal brown; a white line on each side of the thorax is continuous with a broad, white basal streak above the fold to one-fifth; base of dorsum narrowly and indistinctly white; from one-third of costa a very oblique costal streak narrowing below costa into faint line, then expanding in the middle of the wing, where it meets, almost at right angles, the apex of a less oblique streak from the middle of the dorsum. A second slightly oblique spot at the middle of costa; somewhat oblique narrow costal and dorsal streaks at two-thirds meeting in the middle of the wing; following them a pair of inwardly oblique streaks. A large triangular, white costal spot lying chiefly in the cilia just before apex, is more or less distinctly divided into two by a gray streak; opposite it a white spot in the terminal cilia; cilia elsewhere concolorous with wing; extreme apex of wing slightly darker than ground colour. Hind wings and cilia gray. Legs gray, banded with white.

Expanse 6.5 mm.

Locality.—Field, B.C.

Type in author's collection.

The larva mines the underside of leaves of *Spiræa* sp., making a much wrinkled mine in which the parenchyma is entirely consumed; in the breeding jar the larva on leaving the mine, folded the leaf inwards with upper surfaces together; later made a fold on to the underside in the usual way; cocoon in a folded edge of the leaf. Larva collected August 22; moth the following spring.

A very distinct species, belonging in the group of *guttea*, *kalmiella* and *preciosella*.

**Gracilaria hypericella,** n. sp.

Face whitish; palpi whitish, with the tip of the maxillary palpi and the tip of the second segment of the labial palpi and outer and upper surface, and sometimes the entire apical half of the third segment except the extreme tip, blackish. Head ochreous, more or less overlaid with fuscous purple. Ground colour of the fore wing ochreous, more or less overlaid with shining purplish fuscous; usually the costal third of the wing, except toward base and in the apical fourth, is comparatively free from purplish dusting. There is a series of minute fuscous dots on the costal edge; in darker specimens sometimes indistinctly continued across the wing. The dark scales form an indistinct spot in the middle of the disk. Cilia fuscous, with three or four indistinct, darker lines running through them. Hind wings and cilia gray. Fore and middle legs black, except the tarsi; hind legs whitish dusted with fuscous; tarsi white with black tips.

Expanse 8.5–10 mm.

Localities.—Cincinnati, O.; Clermont Co., O.

Types in author's collection.

Seventeen specimens, reared from larvæ on St. John's Wort, *Hypericum cistifolium*, and *H. punctatum*. The larva makes a small linear mine, usually distinctly visible on the upper side of the leaf; this mine enlarges into an elongate blotch on the underside, 7 or 8 mm. long and 2 mm. or less wide, which becomes tentiform, resembling a minute Lithocolletis mine. The cone is rolled from the tip of the leaf downward on to the lower side, usually taking up the entire small leaf. The cocoon is spun on the underside, the leaf being curled over so as entirely to conceal the cocoon. On leaves of *Hypericum cistifolium*, the cocoon is almost always placed near the tip over the midrib, and the leaf on both sides is curled over the cocoon. Larvæ and cocoons collected July 20 and August 27; one captured specimen July 8.

This species is close to *G. desmodiella*, but lacks the violet tint of that species and the discal spot is never distinct.

**Gracilaria ferruginella,** n. sp.

Labial palpi densely dusted with reddish fuscous outwardly, yellowish on inner side, with third segment slightly dusted except at extreme tip; third segment thickened with scales to near apex. Head and thorax purplish brown, slightly mixed with ochreous.

Antennæ purplish fuscous, annulate with ochreous. Fore wings purplish brown, somewhat mixed with ochreous; rarely the ochreous predominates. Beneath the fold irrorated with blackish fuscous; these blackish scales are aggregated into a large spot beneath the trigonal mark. Wing sprinkled with whitish or ochreous spots along the fold. An indistinctly outlined trigonal spot at one-third, is marked on the costa by a series of black spots, usually two larger followed by four small ones; between the trigonal spot and an elongate ochreous spot beyond, the ground colour deepens on the costa to blackish fuscous. The second spot is also marked on costa with blackish dots. Sometimes the trigonal marks are obliterated by fuscous purplish ground colour which then suffuses almost uniformly the entire wing. A few ochreous costal spots along margin from beginning of cilia; one at extreme apex; more conspicuous whitish spots along termen; sometimes irregularly placed whitish dots along dorsal margin. Cilia rust red, especially at their bases and along termen near tornus; conspicuously marked with a dark brown band which crosses in a broad curve from the tips of the costal cilia to the tips of the terminal cilia just beyond the tornus, almost touching the apex; tips also of the apical cilia dark brown. Hind wings and cilia gray. Fore and middle legs closely dusted with fuscous purple, tarsi white with black tips; hind legs gray. Abdomen gray.

Expanse 15 mm.

Localities.—Yosemite Valley, California; Mt. Tamalpais, Marin Co., California; San Bernardino Mts., California.

Types in author's collection.

Three specimens, from larvæ on Azalea, *Rhododendron occidentale*, from Yosemite, and a series of about twenty-five captured specimens.

The larva makes a tentiform mine on the under surface of the leaf, later rolling the leaf from tip down into a cone. The cocoon is whitish elongate. The larvæ were collected July 29, yielding moths about the middle of August; the captured specimens were taken July 9 to 30.

The markings of the cilia are the most distinguishing characteristic of this species. In some of its forms it approaches varieties of *G. alnivorella*, from which the markings in the cilia and thickened palpal segment will always separate it.

# NOTES ON THE NORTH AND CENTRAL AMERICAN SPECIES OF ACANTHOCEPHALA LAP.

(Fam. Coreidæ: Heteroptera.)

BY EDMUND H. GIBSON AND ABBY HOLDRIDGE, U. S. BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

An exceptionally good and large series of specimens of the genus *Acanthocephala* Lap. in the collection of the U. S. National Museum has afforded the writers an opportunity for detailed study of this group, and has enabled them to untangle several of the perplexing questions in regard to the identity of species.

*Acanthocephala* is a neotropical genus and contains a rather long list of described species. However, it seems warranted to believe that with further study of South American material the number of species will be reduced as many will probably be forced into synonymy. Seven species are known to occur in Central America, five of which are also to be found in southern United States.

Previous workers have divided the genus into two subgenera, according to the variation in the form and shape of the thorax, but as this character exhibits great variability within a species and the form and the shape of the dilatation of the hind tibia is certainly of more value in separating the species and is constant within a species, the present authors feel justified in not recognizing the old subgeneric divisions and are even restrained from forming new ones.

*Acanthocephala* was described by Laporte in 1832, Ess. Hem., p. 29, and may be characterized as follows:

Head short, terminating in a spine as viewed from above. Antennæ long and slender, first joint stouter than the rest and slightly longer than the length of the head, fourth joint usually somewhat curved. Thorax wider than elytra. Membrane extending slightly beyond apex of abdomen. Posterior femora more or less swollen, sometimes greatly so and curved, armed with prominent spines.

Posterior tibia with dilatations on either side, the outer dilatation the widest and longest.

It is the largest and best known genus of the tribe *Acanthocephalini* Stal. The orthotype of the genus is *latipes* Drury.

The following key to the species includes all those occurring in Central and North America.

KEY.

1. Thorax greatly expanded laterally beyond margin of abdomen and elytra. Thorax prominently concave.....*declivis* Say.
   Thorax wider than abdomen but not greatly expanded, not prominently concave.....2
2. Dilatation of posterior tibia very small and limited to basal third. Inner margin of posterior tibia spinous in male. Femora of male greatly swollen.....*bicoloripes* Stal.
   Dilatation of posterior tibia noticeably greater, inner margin of male comparatively smooth.....3
3. Outer dilatation of posterior tibia in both sexes very broad, widened at apex and broadly rounding.....*latipes* Drury.
   Form of dilatation of posterior tibia not as above.....4
4. Outer dilatation of posterior tibia in both sexes broad to almost the very tip, but not widened at apex. Large species.....*granulosa* Dall.
   Outer dilatation of posterior tibia not wide at or near the apex. If it extends to near the apex then much narrowed.....5
5. Species small. Dilatation of posterior tibia in both sexes extending but two-thirds or slightly more the entire length of tibia.....*terminalis* Dall.
   Species large. Dilatation of posterior tibia extending distinctly more than two-thirds the length of tibia, sometimes to nearly the apex.....6
6. The outer dilatation of posterior tibia of male without distinct scallops. Hind femora of male usually greatly swollen and bowed. Female broad. Thorax prominently tuberculate.....*femorata* Fabr.
   The outer dilatation of posterior tibia of male with distinct scallops. Hind femora straight and not as greatly swollen. Female comparatively more narrow. Thorax minutely tuberculated.....*confraterna* Uhl.

**Acanthocephala bicoloripes** Stal.

*Metapodius bicoloripes* Stal., Ofv. Vet. Ak. Forh. p. 184, 1855.

This species may easily be distinguished from all others by the small and extremely short dilatation of the posterior tibia which is limited to the basal third of the tibia. The apical two-thirds of the posterior tibia in the female is slender and slightly spinous along inner margin, while in the male it is gradually narrowing and distinctly and coarsely spinous. The hind femora of the male is greatly swollen and somewhat curved as in *femorata* Fabr. It is a distinctly smaller species than *femorata* Fabr.

It has been recorded from Costa Rica and Columbia. All specimens examined are from the first mentioned country.

### Acanthocephala femorata Fabr.

*Cimex femorata* Fabricius, Syst. Ent., p. 708, 1775.
*Rhinuchus nasula* Say, New Harm. Indiana, p. 10, 1832.
*Metapodius bispinus* Westwood, in Hope Cat., II., p. 15, 1842.
*Metapodius obscura* Westwood, in Hope Cat., II., p. 15, 1842.
*Metapodius luctuosa* Stal., Œv. Vet. Ak. Forh., p. 184, 1855.

Of all the species this one shows the greatest variability, both in male and female. The variations are most notable in the general size of the bug and character of its posterior femora. The posterior femora of the male varies from one extreme in being very greatly swollen and prominently curved, to the other extreme of being only normally swollen and almost straight. Innumerable gradations between the two are to be found. The character of the dilatation of the posterior tibia is, however, stable.

This species has been recorded from all of the Southern States, and is also known to occur in Mexico and Central America.

### Acanthocephala confraterna Uhl.

*Metapodius confraterna* Uhler, Proc. Bost. Soc. Nat. Hist., vol. XIV, p. 99, 1871.

In general this species most nearly resembles the preceding; especially is this so with the females. The character of the dilatation of the posterior tibia of the male is like that exhibited in *terminalis* Dall. The posterior femora of the male are more slender and not so curving as in *femorata* Fabr. The females are somewhat longer and narrower than in *femorata* Fabr. The species is noticeably larger than *terminalis* Dall.

The species examined are from Florida and Texas.

**Acanthocephala terminalis** Dall.

*Metapodius terminalis* Dallas, List of Hem., II, p. 432, 1852.

*Metapodius instabilis* Uhler, Proc. Bost. Soc. Nat. Hist., vol. XIV, p. 98, 1871.

This is the smallest species of the genus and is the most constant in its characters. Normally it is very dark, almost black. The posterior femora in the male is only slightly larger than in the female.

The authors are unable to separate Uhler's *instabilis* from this species, and feel warranted in placing it in synonymy with *terminalis* Dall.

Specimens in the National Museum collection record its distribution from New York west through Illinois and Missouri and south to Texas.

**Acanthocephala granulosa** Dall.

*Metapodius granulosa* Dallas, List Hem., II, p. 430, 1852.

*Diactor alata* Herr.-Sch., Wanz. Ins., VI, p. 53, 1842.

*Metapodius thomasii* Uhler, Hayden's Surv. Mont., p. 339, 1872.

The wide dilatation of the posterior tibia which extends to the apex is characteristic of this and the following species. In *latipes* Drury, however, the dilatation is widened and broadly rounded at the apex, while in this species it is slightly and gradually narrowed. Typical specimens have their elytra of a distinct mahogany brown. The long, bright orange fourth antennal segment with the bright orange tibia of the first two pairs of legs are also characteristic. It is a large species and is known to occur in Arizona, New Mexico and Texas, as well as throughout Central America.

**Acanthocephala latipes** Drury.

*Cimex latipes* Drury, Ill. Nat. Hist., III, p. 62, 1782.

*Lygaeus compressipes* Fabr., Syst. Rhyng., p. 209, 1803.

*Acanthocephala albicollis* Dall., List, III, p. 427, 1852.

The characters as mentioned in the key to the species will suffice to distinguish this species. It might also be remarked that the fourth antennal joint is extremely long, and the posterior-lateral angles of the thorax terminate in almost a spine.

Specimens are at hand from Panama and Costa Rica.

**Acanthocephala declivis** Say.

*Acanthocephala declivis* Say, New Harm. Ind., 1832.

*Diactor alata* Burm., Handb., II, I, p. 334, 1835.

*Metapodius thoracicus* Dall., List, II, p. 428, 1852.

*Acanthocephala subalata* Distant, Biol. Cent. Amer., p. 119, 1881.

The extremely wide and concave thorax readily separates this species, although the shape of the posterior lateral angles varies a great deal. These are broadly rounding in some specimens, in others acutely pointed, with every intergradation to be found. The form of the dilatation of the posterior tibia places it with *latipes* Drury and *granulosa* Dall. The general size varies from specimens as small as *terminalis* Dall. to those larger than *granulosa* Dall.

The species is known to occur throughout Central America and north into southern United States.

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## THE BLACK CHERRY APHIS, *MYZUS CERASI.*

On page 434 of the Canadian Entomologist for 1917, Mr. W. A. Ross calls attention to the fact that in my paper before the California State Fruit Growers' Convention in 1914, the black cherry aphis was referred to as a species not having alternate food habits. Since that date we have recorded this species a few times in small numbers upon water cress, collected by L. B. Bragg. However, our observations and records indicate that this aphid continues throughout the year upon the cherry in Colorado, and we have never found it abundant upon the alternate host.

No one in the department recalls seeing this species upon the sweet cherries—Royal Ann, Bing, Black Tartarin, Black Republican, etc., and we can recall but very few cases where it has been seen in any abundance upon the semi-acid cherries, the Dukes, but it is a common and, often, abundant louse upon the sour red cherries, English Morello, Montmorency wragg and their like, on the eastern slope of the mountains. It yields readily to the application of the contact insecticides as the leaves do not curl enough to give protection to the lice.

C. P. GILLETTE.

# NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA) PART V.

BY CHARLES P. ALEXANDER, UNIVERSITY OF KANSAS, LAWRENCE, KAS.

(Continued from page 165.)

Genus *Tricyphona* Zetterstedt.

**Tricyphona protea,** new species.

General coloration pale yellowish brown; wings with the free portion of vein $R_2$ very long, only a little shorter than the sector; cell $R_4$ short-petiolate; cell *1st* $M_2$ open by the atrophy of *m*.

*Male.*—Length 6.4 mm.; wing, 6.5 mm.

Described from an alcoholic specimen.

Rostrum and palpi pale; palpal segments nearly subequal, the fourth a little longer than the third and more slender. Antennæ dark brown, the basal segments paler; flagellar segments oval, the terminal segment not elongated. Head yellowish, darkest on the vertex.

Thorax light yellowish brown without apparent darker stripes. Halteres short, pale, the knobs large. Legs with the coxæ and trochanters dull yellow; remainder of the legs broken. Wings a pale yellowish tinge; veins yellowish brown. Venation: $Sc_1$ ending just before the fork of $R_{2+3}$; $Sc_2$ some distance before the origin of the sector, this distance about equal to the basal deflection of $Cu_1$; vein $R_2$ fused with $R_1$ for a short distance back from the wing-margin, this fused portion about equal to *r-m*; petiola of cell $R_4$ short, less than *r-m*; cell *1st* $M_2$ open by the atrophy of *m*.

Abdominal tergites dark brown, paler laterally; sternites dull yellow; apices of the segments darker brown; hypopygium dull yellow.

*Habitat.*—Washington.

*Holotype.*—♂, Mt. Rainier, Washington.

In many respects this is a very remarkable fly, easily told from all its relatives by the great length of vein $R_2$ before its fusion with $R_1$. I have pointed out in another paper the reasons for changing the nomenclature of the radial veins in the Pediciini, this vein $R_2$ having been hitherto considered as being the radial cross-vein.

July, 1918

SUBFAMILY TIPULINÆ.

Genus *Tipula* Linnæus.

**Tipula margarita,** new species.

General coloration of the head and thorax light gray; antennæ short, black, the three basal segments orange-yellow; femora with a broad, subterminal yellow ring; wings with four brown cross-bands; abdomen yellow, the tergites with a broad, dark brown median and narrow dark brown sublateral stripes; lateral margin of the tergites broadly light gray; male hypopygium with the ninth tergite large, subquadrate, with a deep median split; ninth pleurite complete.

*Male.*—Length about 13 mm.; wing 14.4 mm.

Frontal prolongation of the head long, grayish above, more reddish laterally, nasus long and slender. Palpi with the first segment reddish, the remainder black. Antennæ with the first segment long and slender, orange-yellow, a little grayish pruinose on the basal fourth; segments two and three orange-yellow, remaining flagellar segments dark brown, the apices only a little more reddish; flagellar segments very short with long verticils, the basal swelling inconspicuous, only a little thicker than the rest of the segment. Head gray, on the disk of the vertex suffused with brown; vertical tubercle prominent, narrowly split by a deep, impressed median line; occiput more reddish.

Thorax gray, the praescutum with three dark brownish gray stripes, the median one longest, broadest in front, narrowed to the suture; scutum light gray with two darker gray blotches, the larger of which lies on the scutal lobes; scutellum light gray with a faint, reddish cast; postnotum light gray with a narrow, indistinct median brown line which is continued forwards on to the scutellum. Pleura light grayish pruinose. Halteres rather short, yellow, the knobs dark brown. Legs with the coxæ light gray, pruinose; trochanters dull yellow; femora yellow, beyond the middle passing into light brown; tips broadly black, a broad, yellow subterminal annulus; this yellow femoral ring is most distinct on the fore legs, less evident on the posterior legs; tibiæ and tarsi dark brown. Wings whitish with a heavy brown pattern; dark brown blotches at the arculus, stigma, and a smaller one at the origin of the sector; four grayish brown cross-bands, the first

basal in position occupying the cubital and anal cells; the second band about mid-length of the basal cells, darkest in cells *R* and *M*, in the anal cells paler but more diffused; the third band at the cord, darkest near the stigma and along *Cu;* fourth band occupying the wing-apex, darkest in the apices of cells $R_2$ and $R_3$, caudad of these paler; base of the wing, costal and subcostal cells indistinctly tinged with yellow; veins dark brown. Venation: vein $R_2$ persistent for its entire length; petiole of cell $M_1$ shorter than this cell; cross-vein *m-cu* present, situated at about the basal third or quarter of cell *1st* $M_2$.

Abdominal tergites yellow with a very broad, dark brownish black dorsal stripe beginning on segment two, continuing to segment seven; this occupies most of the dorsum of all these segments being interrupted caudally by a broad, yellowish ring; lateral margins of the tergites very broadly silvery, caudal margins very narrowly of the same colour; a narrow, interrupted, dark brownish black line just inside the gray margins; segments eight and nine brown. Sternites light yellowish brown with an indistinct, pale brownish line, the apical sternites light brown. Male hypopygium enlarged; ninth tergite very large and prominent, subquadrate, the dorsum almost flat, not chitinized; caudal margin with a very deep, narrow, median split, the adjacent lobes very broad, their apices almost truncated, very narrowly chitinized. Ninth pleurite small, complete. Ninth sternite deeply and broadly split, the margins fringed with abundant long, pale hairs that are decussate across this median notch. Eighth sternite almost straight or with a very broad, V-shaped notch, on either side with a large tuft of yellow hairs that are decussate across the median line.

*Habitat.*—New York.

*Holotype.*—♂, Ithaca, Tompkins Co., New York, June 12, 1915.

This beautiful *Tipula* is very different from any species that I have ever seen, in some ways suggesting *Tipula ternaria* Loew of Northeastern North America but in reality a very different species. The yellow subterminal annulus on the femora will separate the fly from all its relatives in Eastern North America.

**Tipula kirbyana,** new species.

Allied to *T. whitneyi;* general colour of the head and thorax light gray; a narrow, brown or black dorso-median vitta extends the length of the thorax and abdomen; antennæ black; femora strongly incrassated; wings indistinctly marked with pale brownish clouds; abdomen reddish yellow with a brown dorso-median black stripe.

*Male.*—Length 10.2 mm.; wing 11.7 mm.

Palpi dark brown. Frontal prolongation of the head moderately elongated, deep chestnut-brown, above sparsely dusted with gray; nasus lacking. Antennæ dark brown, the scapal segments a little more reddish and sparsely dusted with gray; flagellar segments rather short, deeply incised, the basal swelling shorter than the pedicel of each segment. Head gray, the vertical tubercle large, prominent, with an indistinct, brown median line that becomes indistinct behind; eyes very small, widely separated.

Thorax light gray, the usual praescutal stripes not very distinct, the median one tinged with brown; scutellum more reddish with an indistinct, median brown line; postnotum gray with a brown, median line. Pleura light gray, the dorso-pleural membrane obscure yellowish. Halteres light brown, the knobs a little darker brown. Legs with the coxæ long and powerful, light gray; trochanters chestnut-brown; femora short and stout, considerably incrassated apically, reddish brown; dark brown at the tips; tibiæ dull brownish yellow, the tips darkened; tarsi dark brown, the metatarsi paler. Wings slightly crumpled, possibly the first indications of degeneracy; membrane indistinctly blotched with brownish; cells *C* and *Sc* a little more yellowish; stigma indistinct, brown; clouds of brown at the origin of *Rs*; along the cord in cell *M;* apex of cell *1st A*, etc. Venation: vein $R_2$ persistent but pale at its tip; cell *1st* $M_2$ very small and short, only a little longer than broad; fork of cell $M_1$ deep; cross-vein *m-cu* obliterated by the fusion of $Cu_1$ on $M_{3+4}$.

First abdominal tergite brownish basally, the remainder of the dorsum of segments 1 to 8 light reddish yellow, the segments broadly ringed with yellowish; a very conspicuous black median vitta runs the length of the abdomen, interrupted only by the yellow caudal margins to the segments; this vitta begins on segment 1 and continues to the eighth tergite;

lateral margins of the tergites broadly yellowish. Sternites reddish brown with an indistinct, narrow, brown median line; lateral portions of the sternites infuscated, caudal margins of the segments yellowish. Male hypopygium with the ninth tergite rather prominent, the caudal margin with a broad and deep, U-shaped median notch; the basal portion of the tergite is tumid, shiny chestnut but a broad margin around the notch is flattened, the extreme edge narrowly blackened, chitinized, lateral lobes truncated. Ninth pleurite complete, semicircular; outer pleural appendage elongate-cylindrical, clothed with long, golden hairs; inner pleural appendage very long and narrow, jutting into the notch of the tergite, the outer edge clothed with long, pale hairs that project backward to produce a hystriciform appearance; apex of the appendage shiny chestnut-brown. From the ventral caudal angle of the pleurite arises a shiny, chestnut-brown, flattened lobe that is directed caudad, its apex truncated. Ninth sternite with a deep, V-shaped median notch that extends a little more than half the distance to the margin of the eighth sternite. Eighth sternite unarmed.

*Habitat.*—Alaska.

*Holotype.*—♂, Point Barrow, Alaska, July 14, 1898.

This species is closely allied to *Tipula whitneyi* Alex. from the Pribilof Islands, Alaska, but is readily separated by the full-winged males and the details of the hypopygium.

## NOTE ON OVIPOSITION OF GASTEROPHILUS NASALIS L.

BY CHARLES H. T. TOWNSEND, WASHINGTON, D.C.

In the November, 1892, issue of Entomological News, pages 227-8, I published some notes on this subject, in which I stated that "I noticed the fly alight several times, always exactly in the region ventrad of the first cervical vertebræ." This observation relates to a female which I captured May 15, 1892, while it was flying at the throat of my horse, near Las Cruces, New Mexico. In the same notes I quoted Brauer's statement (Mon. Oestr., page 60) that "according to Dr. Green *G. nasalis* deposits its white eggs in the region of the throat of the horse." I further stated that I had not found the eggs of the fly, though I searched the ventral region of the throat after capturing the above female.

On October 2 and 3, 1917, while in camp on the East Verde River, Arizona, at a point about eight miles north of Payson, altitude 4,400 feet, I took two females of *nasalis*, and noted others, flying at the throat of my horse, but in no case did they alight there. They were seen to hover directly under the animal's throat, and then dart suddenly at the muzzle. I saw this operation repeated many times before I was able to capture the fly, as this action of darting at the muzzle made the animal especially wild. On examination immediately thereafter, I found several whitish eggs with their sharp bases penetrating and adhering in the skin of the upper lip. These eggs were lost owing to the frantic struggles of the horse at the time, but similar eggs were dissected from the abdomen of the fly.

The egg is practically the same size and shape as that of *intestinalis* and not at all like that of *haemorrhoidalis*, but the anal end is moderately pointed though somewhat blunt as seen under a high power. It is capable, however, of penetrating tender skin, as tested on the back of my finger. Moreover, the chitinized clasping forceps at the end of the heavy ovipositor are quite sharp in *nasalis*, while they are decidedly blunt in both *intestinalis* and *haemorrhoidalis*.

On the East Verde *intestinalis* was common but caused no such alarm as did *nasalis* while ovipositing. No specimen of *haemorrhoidalis* was seen anywhere in that region.

The above facts seem to indicate that *nasalis* oviposits about the muzzle of the horse, hovering under the throat merely as a preliminary while seeking a good opportunity to dart at the lips, and piercing the tender skin with the sharpened forceps of the ovipositor while thrusting the anal end of the egg into the puncture. It seems further that this habit of darting at the muzzle of the animal was known to Linnæus, else why should he have named the species *nasalis?* It appears that in later times the preliminary action of the fly in seeking the throat has been commonly observed and its darting thence to the muzzle, overlooked by some investigators though recorded by others, hence the mistaken opinion still held by some that it oviposited in the region of the throat. It is against all reason that the eggs should be placed under the throat,

since they would be least likely to reach the mouth from such location.

It may be added that *Gasterophilus* has no incubating uterus, but that the large ovaries are packed with eggs which come down a few at a time for deposition. The eggs of the above *nasalis* female show no incubation, and the chorion is transversely corrugated so that it holds on insertion in the skin. All the records of lip and muzzle oviposition of this species that I have seen state that the eggs are attached to the hairs. This might easily happen when the fly misses its mark, and no doubt it misses frequently, but the effort is evidently directed at the tender skin of the lips. The eggs are sticky when freshly extruded, and the fly may even, at times, inadvertently leave them on the hairs of the throat when caught by the convulsive movements of the intended host. This would explain throat oviposition records.

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## AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA.

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

(Continued from page 213.)

141. *Gaurotes cressoni* Bland.

Rare in Northern California. Several taken by Van Dyke in Marin County on flowers of the wild honeysuckle in April.

142. *Leptura obliterata* Hald.

Breeds in Douglas spruce, sapwood of redwood, and other coniferous trees. Found in the coast counties from Santa Cruz to the Oregon line.

143. *Leptura soror* LeConte.

Found throughout the Sierras at altitudes of 4,000–8,000 feet, usually on flowers of veratin. Taken by author at Donner Lake and Tahoe Tavern, breeding in branches of *Pinus ponderosa*. July 1–21.

144. *Leptura propinqua* Bland.

Found north and in the higher Sierras on various flowers. Breeds in various coniferous trees. Taken by author at Donner Lake. July 10.

145. *Leptura kerniana* Fall.
Taken by Daggett on the Kern River.

146. *Leptura plagifera* LeConte.
Taken rarely in northern Sierras. Found especially on the eastern sides of the Cascades.

147. *Leptura rubida* LeConte.
Rare. Taken in Northern California, Coast belt to San Francisco, and in Sierras—a different colour phase in each section.

148. *Leptura subargentata* Kirby.
Common at Camp Meeker, Sonoma County.
var. *ruficeps* LeConte.
Found throughout the Sierras.
var *rhodopus* LeConte.
Breeds in tan bark oak.
var. *similis* Kirby.

149. *Leptura molybdica* LeConte.
Fairly common throughout the State on various flowers. Taken by Fall at Pasadena on Ceanothus; by Van Dyke in Sierra County, and the middle and northern Sierras.

150. *Leptura læta* LeConte.
Found throughout the State; not abundant anywhere, most common in the foothills of the Sierras. Found by Van Dyke on flowers, especially those of California wild holly. Bred by Rivers from live oak. Taken by author at Donner Lake, July 12.

151. *Leptura tribalteata* LeConte.
Found in Northern California and Sierras as far south as Walker Basin. Taken by author at Donner Lake July 6 on meadow flowers.

152. *Leptura coquilletti* Fall.
Taken on flowers of *Eriogonum fasciculatum* in June by Ricksecker. Taken by Van Dyke in Sierra Madre Mts., San Bernardino Mts., and also Los Angeles County.

153. *Leptura impura* LeConte.
Taken rarely in the redwood belt of Sonoma County. One specimen taken by Van Dyke in Siskiyou County. Supposed by Blaisdell to breed in the sapwood of redwood.

154. *Leptura instabilis* Hald.
Taken in moderate numbers in parts of Northern California and in Sierras. Rare in June on Pomona foothills. Taken by Van Dyke on lupine at Tahoe; by author at Donner Lake, July 3.

155. *Leptura sexmaculata* Linne.
Northern, barely running over into this State. Breeds in spruce.

156. *Leptura barberi* Fall.
Taken in Humboldt and Shasta Counties. Breeds in the Sitka spruce. Rather rare.

157. *Leptura vexatrix* Mannerheim.
Found on umbelliferous flowers, yarrow, etc., through the Sierras from Siskiyou County south to Calaveras County. This is considered by Van Dyke as a variety of *quadrillum* Lec.

158. *Leptura sexspilota* LeConte.
Taken abundantly in Southern California by Van Dyke in May and June on flowers of greasewood; also taken near Los Angeles on wild walnut. Taken at San Pedro Martir, Lower California.

159. *Leptura matthewsii* LeConte.
Never found on flowers, but resting on leaves. Found in the Coast belt from Marin County to the northern line. Has been bred from the sapwood of the redwood. June 27.

160. *Leptura grossa* LeConte.
Rare in the Sierras, on veratrin flowers. One taken by Van Dyke on stump of *Pinus ponderosa* in Yosemite Valley.

161. *Leptura brevicornis* LeConte.
Found rarely in the north and in the Sierras. Breeds in *Pinus ponderosa*. Taken by author at Donner Lake. July 7.

162. *Leptura nigrella* Say.
No data.

163. *Leptura carbonata* LeConte.
Northern California.

164. *Leptura subcostata* Fall.
One specimen taken by Fall at Tahoe.

165. *Leptura dehiscens* LeConte.
Rare, in the Sierras; northern, one specimen taken by Van Dyke in Siskiyou County. Four taken from small limbs of *Pinus ponderosa* at Calistoga by author. May 28.

166. *Leptura sanguinea* LeConte.
Found in Northern California and throughout the Sierras on veratrin and other flowers. May 30–July 17.

167. *Leptura lætifica* LeConte.
Taken in Sierras and Northern California; common in places in Shasta Lake, and Sonoma Counties on flowers of Eriogonum, etc. May 25–June 19.

168. *Leptura pernigra* Linnell.
Taken in Sierras Madre Mts., Los Angeles County by Van Dyke.

169. *Leptura quadrillum* LeConte.
Found on yarrow, etc., in the northern part of the State.

170. *Leptura chrysocoma* Kirby.
Common in the Sierras and Northern California on veratrin, yarrow, and other flowers. Taken in large numbers at Donner Lake and Tahoe by the author in July. July 1–21.

171. *Leptura dolorosa* LeConte.
Found especially on the Ceanothus in Northern California and the Sierras; common in places.

172. *Leptura crassipes* LeConte.
Found throughout the State, common in the northern part, less common in the south. Taken by Fall in the San Bernardino Mts. Usually found on the flowers of the yarrow, ox-eyed daisy, etc. Bred from *Umbellularia californica* by Rivers and Van Dyke. Bred from *Eucalyptus globulus* by Van Dyke. Taken by author at Calistoga. May 21.

173. *Leptura behrensii* LeConte.
Rare Two specimens taken by Baumberger in Northern Sonoma Co.; type specimen from Mendocino Co.; one taken by Van Dyke in Humbolt County.

174. *Leptura scripta* LeConte.
Common on Coast belt from Marin County to northern line on flowers, especially Azalea, Rhododendron; rare in the various parts of the Sierras. June 9.

175. *Leptura gnathoides* LeConte.
Found in Sierras and Northern California. Rare. Taken in Placer County by Van Dyke on young trees of post cedar.

176. *Leptura valida* LeConte.
Found rarely from Shasta to the Southern Sierras. Breeds in pine. Taken by author at Donner Lake. July 18.

177. *Leptura insignis* Fall.
Taken by Fuchs and Fenyes at Monterey. Breeds in Monterey pine; remains also found in *Pinus muricata* at Inverness; a specimen was bred by Van Dyke from Douglas spruce branch of unknown locality.

178. *Leptura aspera* LeConte.
Northern, may possibly run over into California.

179. *Leptura cubitalis* LeConte.
This species, which looks like an Acmæops, is fairly common in the middle part of California. It is found on wild rose, etc., in Sonoma, Napa, San Mateo, and Lake Counties. June 8–29.

180. *Ophistomis ventralis* Horn.
Taken at El Taste, Lower California.

181. *Strangularia delicata* LeConte.
Occasionally found in most parts of the State, but is more common in the north and middle Sierras on various flowers. June 3.

(To be continued)

Mailed July 10th, 1918.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### THE RELATION OF AGRONOMY TO ENTOMOLOGY: A PRACTICAL ILLUSTRATION.

BY JOHN J. DAVIS, WEST LAFAYETTE, INDIANA.

Numerous instances are on record where the occurrence of a noxious insect has resulted in recommendations which are not only effective in controlling the pest, but at the same time a benefit to agriculture. It is here sufficient to illustrate with such common examples as the northern corn root-worm (*Diabrotica longicornis*) and the corn root-aphis (*Aphis maidi-radicis*) which are controllable by proper rotations, and the alfalfa weevil (*Phytonomus posticus*) which is checked by the use of methods beneficial to the plant and disastrous to the insect. Recommendations for Hessian fly control may likewise be considered beneficial from the point of view of the agronomist, since it has been learned that the time of seeding to avoid the fly attack in the fall is coincident with the proper seeding date regardless of insect prevalence, and further that the supplementary recommendation, namely that of destroying the summer brood of fly by plowing under the stubble, is a good agronomic practice according to certain authorities, and especially in those sections where the fly is so frequently abundant.

In the past we have been largely dependent on two practices for the control of the common white grub (*Lachnosterna* spp.), namely that of pasturing hogs in infested fields and a rotation whereby corn, the most important field crop injured by grubs, is planted the year of grub abundance on ground which was continually cultivated during the flight of May-beetles the preceding spring. In other words, the control is practically a recommendation to plant corn on corn ground, that is, corn on ground likely to contain fewer grubs, in order to avoid injury. This can hardly be considered a remedy since it avoids rather than destroys the insect, and the practice of planting corn on corn ground is not good

agronomic advice, nor indeed is it a good entomological practice in relation to such insects as the root aphis and root worm.

For several years past our records have shown very little or no injury to corn planted on ground which was in clover the preceding year, and not infrequently observant farmers have reported this condition. The past year observations which are more conclusive and which corroborate the above statment have been made. For instance, last fall at Cascade, Iowa, we collected grubs behind a plow which circled a field, two-thirds of which bore a crop of timothy and one-third a good stand of alsike clover. As the plow turned up the soil in the timothy area the grubs were very abundant but as soon as the clover sod was reached, scarcely a grub could be found. Further, at one corner of the clover area the clover had died out, apparently because the lime had washed away, and the small patch had grown up in smartweed, sorrel and the like, and here the grubs were again abundant as in the timothy end of the field. At Richland, Michigan, a farmer limed his field preparatory to sowing clover, but left one drill row unlimed to satisfy himself on the value of the lime. Last spring when the May-beetles were abundant at Richland there was an excellent stand of red clover over the entire field excepting the unlimed strip which grew up to grass and timothy. An examination this spring revealed 30 to 40 grubs to the square yard in the unlimed strip, that is, where the timothy was growing, while in the rest of the field where the clover had made a good growth only 1 or 2 grubs to the square yard were to be found, and in digging a trench from the clover into the timothy one knew as soon as the timothy strip was reached by an abundance of grubs. All of these facts give us conclusive evidence that May-beetles will not deposit their eggs in numbers in ground which has a stand of clover which covers the ground, probably because the clover mats over the surface and makes it difficult for the beetles to make an entrance.

The natural conclusion is to substitute clover for timothy in the rotation and to follow corn on clover ground, especially the year following an abundance of May-beetles. The growing of clover in place of timothy is a practice which has been recommended and advised by agronomists, but in most sections where

the grubs are destructive the advice has not been followed. Farmers, as a rule, tell us they cannot grow clover in northern Illinois, southern Wisconsin and similar latitudes because of winter killing. On the contrary thoroughly competent authorities inform us that if the land is properly prepared for clover the danger of loss by winter killing is of little consequence, and that agriculture would be greatly improved in these sections if it were possible to secure a greater acreage of clover to replace the now large acreage of timothy. With the knowledge we now possess with regard to the importance of clover in the rotation as a means of preventing white grub injury it is not unlikely that it will have some influence in reducing the timothy and increasing the clover acreage in the white grub districts, and in this way in part compensates for the losses which have resulted within the past ten years.

A rotation which we have recommended in the past for the white grub territory of northern Illinois and southern Wisconsin and similar latitudes and which is approved by the agronomists is oats or barley, clover and corn. If oats or barley are on the ground the year of the May-beetle flight it will contain many grubs but since either will be followed by clover which is little injured by white grubs, no harmful results will follow. If the field bears a good stand of clover during May and June of the year May-beetles are abundant, few or no eggs will be laid in the ground and it can be safely followed by corn, while if the field is in corn the year the beetles are abundant, few eggs will be laid if the field is kept cultivated during the flight of the May-beetles, as it naturally should be, and further even should there be eggs laid in the corn ground as there occasionally are when the field is alongside a timber lot, the ground would be planted to oats or barley the following year according to the rotation suggested and these grains are little injured by grubs.

These few facts regarding the role of clover in the rotation to prevent white grub losses are brought together not only to emphasize the entomological importance of this crop, but also to show again the intimate relation between the study of soils and crops and field crop entomology, and the importance of a more intimate correlation of the two subjects.

# NEW SPECIES OF ODONATA FROM THE SOUTH-WESTERN UNITED STATES.

## Part I. Three New Argias.

BY CLARENCE HAMILTON KENNEDY, CORNELL UNIVERSITY, ITHACA, N.Y.

The following new species of Argia have been in the writer's hands for three years awaiting such time as he might have to describe them. The specimens from the Museum of Comparative Zoology labelled *solita* were called to my attention by Dr. Calvert. I wish to thank Dr. Calvert and Dr. Banks for the privilege of describing these. After I had taken *hinei* at Fillmore, Calif., I found that Dr. Hine had taken it in Arizona and his material was in Mr. Williamson's hands awaiting description. I wish to thank Mr. Williamson for the privilege of describing these.

**Argia solita,** n. sp.

*Holotype.*—Male in the Museum of Comparative Zoology, Cambridge, Mass., with the pin labels; "Arizona, C. U. Lot 35;" and "A. solita." The Cornell catalogue shows that this was purchased from H. K. Morrison in 1883, when it was probably sent to Hagen for identification.

A study of the penes shows this to be a near relative of *Argia agrioides*. Among my material of *agrioides* from California are specimens from Chico which have unforked humeral stripes and which in drying have turned partially violet, so this may be a badly faded, pale variety of *agrioides*.

Length of abdomen 26 mm., length of hind wing 22 mm.

Colour: labium creamy; entire face and head otherwise violet, except rear of head which is pale (creamy?). Eyes?

Prothorax violet with a small black spot on the side. Mesothorax and metathorax violet, shading to creamy below with a mid-dorsal black stripe one-sixth as wide as either mesepisternum. Humeral stripe a hair line and a similar black line on second lateral suture. Legs and feet pale with a narrow, external black stripe on the femur. Wings hyaline, pterostigma mounting but one cell and brown in colour.

Abdomen violet. Segments 1 and 2 without distinct markings except a lateral spot at apex of seg. 1 and a narrow, black ring around apex of seg. 2. Segs. 3–6 each with a narrow, black

apical ring and a lateral apical spot of irregular outline which is one-fourth as long as the segment. Seg. 7 with an interrupted, irregular stripe along the side, below the apical end of which is a small detached spot. No apical ring on seg. 7. Segs. 8–10 blue? —some irregular, obscure dark areas along lower side of seg. 8, which may represent a black lateral stripe in better preserved material.

Dorsal appendages short with a large ventral hook on the internal angle. Inferior appendage, bilobed, the lobes triangular and subequal; the posterior lobe directed caudad, the dorsal lobe directed dorsad, bearing on its apex an ill-defined spur directed dorsad. Inferior appendages as long as seg. 10 and twice the length of the superior appendages.

Female unknown.

**Argia alberta,** n. sp.

*Holotype.*—Male, collected by the writer in the Owen's Valley, at Laws, California, August, 1915, and now in the U. S. National Museum.

*Paratype.*—Female, collected by the writer in the Owen's Valley, at Laws, California, August 17, 1915, and now in the U. S. National Museum.

This species simulates *Argia sedula* in colour and appendages, but the penes show this to be more nearly related to the northern *violacea* group, while *sedula* is nearer *translata* and a large series of Mexican species.

I take pleasure in naming it after my father Albert Hamilton Kennedy.

Male, length of abdomen 22 mm., hind wing 18 mm.; female, abdomen 22 mm., hind wing 18 mm.;

*Male.*—Colour: Labrum pale blue, the remainder of the face and head blue with an olive or, in some dried material, a violet cast. Under surface of head yellowish gray with a small black spot on each side of the occipital foramen. Clypeus edged with black. A wide bar through the paired ocelli and a broad, black stripe behind each postocular area. Eyes dark blue, paler below.

Prothorax black dorsally with a bluish spot on each side. Mesothorax and metathorax dull blue (violet or brown in dried material) darker and duller on the dorsal surface and grayish on

the sides. Mid-dorsal stripe occupying one-third of the area between the humeral sutures. Humeral stripe half as wide as the mid-dorsal, its upper third forked. A black line on second lateral suture 1 mm. wide.

Pterostigmata brown subtended by one cell. Legs pale with blue on base of femora, broadly marked with black on the dorsal and anterior surfaces of the femora and on the anterior and internal surfaces of the tibiæ. Tarsi black.

Abdomen with segs. 1–3 dull blue becoming duller or brownish on the lower sides. Seg. 1 with a baso-dorsal black spot. Seg. 2 with a narrow apical band and a lateral stripe black. Seg. 3 with the apical third and a lateral stripe black. Segs. 4–7 with the apical third and the dorsum black except a narrow basal band blue, the sides bluish or brownish. Segs. 8–10 pure, pale blue the lower edges more or less blotched with black.

Superior appendages twice as long as wide when viewed from above, slenderer in profile. A prominent, internal, apical hook directed ventrad. Inferior appendages bifid, the lower ramus round or bluntly triangular directed caudad, superior lobe directed dorsad and terminating in an acute point.

*Female.*—Colour as in the male but with the blue of the head and thorax paler. Eyes gray bluish above. Humeral stripe but half as wide as in the male, its branches linear. Legs marked as in male but the black on the femora reduced somewhat. Abdomen brown with a narrow apical band on segs. 2–6. Segs. 2–6 with an apical dorsal spot, a lateral stripe and an oblique spot on the lower apical angle of the side. Seg. 7 with dorsal half black except a narrow band across the base. Segs. 8–9 with dorso-lateral stripe. Seg. 10 pale. In some females seg. 6 is coloured like 7.

Mesostigmal laminæ with no special modifications.

A single male of this is in the Snow Collection from Colorado Springs, Colo., collected by E. S. Tucker. A male and female from Provo, Utah, are in the collection of Dr. Ris.

**Argia hinei,** n. sp.

*Holotype.*—Male, collected by the writer at Fillmore, Ventura Co., Calif., Aug. 7, 1915, and now in the collection of Mr. Williamson.

*Paratype.*—Female, collected by the writer at Fillmore, Ventura Co., Calif., Aug. 7, 1915, and now in the collection of Mr. Williamson.

Other material examined included thirteen males and a second female from Fillmore, Calif., and five males from Santa Barbara, Calif., all of which were of the dark typical coloration. A series of specimens from Arizona with less black were as follows: A male in Dr. Calvert's collection labelled "A. solita" by Hagen and which had been associated in the M. C. Z. collection with the type of *solita*. See figs. 17–22. Seven males and a female from the Huachuca Mts., Arizona, collected by Dr. Hine, July 28–29, 1907, and now in Mr. Williamson's collection. A single male from the Santa Rita Mts., Arizona, in the Snow Collection, Kansas University, collected by Dr. F. H. Snow, in June, at an elevation of 8,000 feet.

I take pleasure in naming this after Dr. Hine, a suggestion made by Mr. Williamson.

Male abdomen length 26–27 mm., hind wing 20 mm.; female abdomen 26 mm., hind wing 21 mm.

*Male.*—Colour: Labium and rear of head pale; labrum, face and top of head violet. A black bar through the ocelli; postocular areas edged posteriorly with black. Eyes violet in life.

Prothorax violet with a mid-dorsal stripe and a lateral stripe black.

Mesothorax and metathorax violet with mid-dorsal keel edged with pale; the mid-dorsal stripe slightly wider than either pale stripe bordering it. Humeral stripe one-third as wide as the mesepimeron, forked in its upper third. Second lateral suture narrowly black. Pterostigmata subtended by one cell, brown. Legs pale with a heavy black stripe on the upper and anterior surfaces of femur, and an internal black stripe on the tibia.

Abdomen with segs. 1–7 violet, segs 8–10 blue with the following black markings: a dorso-basal spot on seg. 1, narrow apical rings on segs. 2–7. Seg. 2 with a lateral stripe not reaching the apical edge. Segs. 3–5 with a spot covering apical fourth of the side, the pairs on segs. 4–6 confluent on the middorsal line. A small antero-lateral spot on seg. 6. Seg. 7 with the dorsal half black except a narrow basal band; and having a small latero-

apical spot in the ventro-apical angle of the segment. Segs. 8 and 9 with more or less black on the lower sides.

Some males show antero-lateral spots on segs. 4–6.

The specimens from Arizona have less black on the head and thorax. In Dr. Calvert's specimen the humeral stripe shows no trace of a fork. In the male from the Santa Rita Mts. the humeral stripe is forked and almost as heavy as in the Fillmore and Santa Barbara specimens. The specimens from the Huachuca Mts. have humeral stripes from the narrow form in the Dr. Calvert male to those in which a fork is suggested by a more or less perfect branch, but in all cases narrow.

Appendages: superior appendage cupped on the ventral surface, with a tooth on the ental edge, which turns under the appendage thus being directed ectad; and a blunt, black subapical ventral tubercle. Inferior appendage bifid, the lower lobe rounded or triangular, the upper directed caudad and bearing a small tooth on its upper edge.

Female colcured brown with the black markings on the head and thorax as in the male. Eyes in life brownish violet. The abdomen with lateral stripes on segs. 2–9, those on segs. 7 and 8 more or less confluent with their mates along the mid-dorsal line. Segs. 2–8 with a latero-apical oblique spot on the lower apical angle of the side. Segs. 2–7 with a narrow apical ring.

The female mesostigmal laminæ have each a small posterior, free lobe.

Explanation of Plate V.

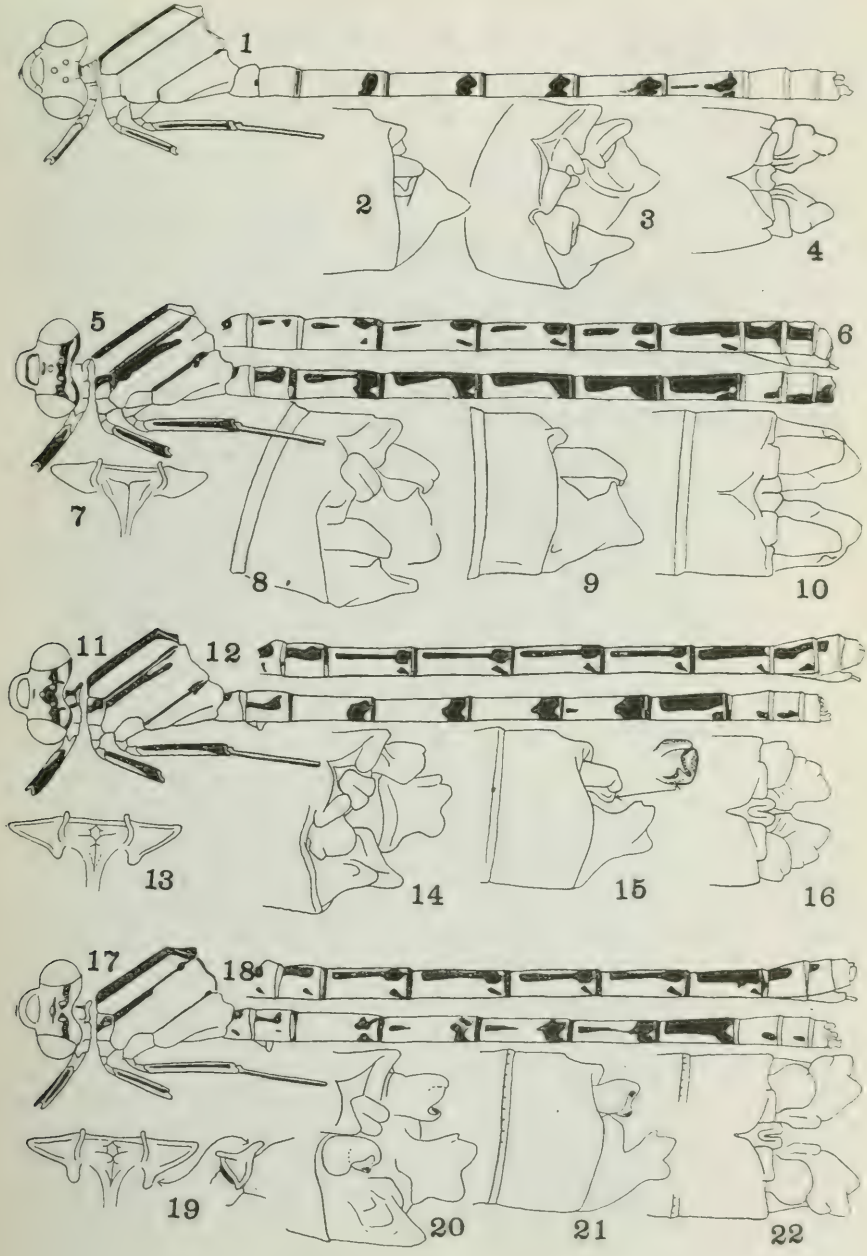
Figs. 1–4. Holotype of *Argia solita*. Fig. 1 colour pattern, figs. 2–4 appendages.

Figs. 5–10. Types of *Argia alberta*. Fig. 5 colour pattern of male, fig. 6 of abdomen of female; fig. 7 mesostigmal lamina of female. Figs. 8–10 male appendages.

Figs. 11–16. Types of *Argia hinei*. Fig. 11 colour pattern of male, fig. 12 of abdomen of female; fig. 13 mesostigmal lamina of female. Figs. 14–16 appendages of male.

Figs. 17–22. Pale *Argia hinei* from Arizona. Figs. 17, 20–22 the male labeled *solita* by Hagen and now in Dr. Calvert's coll.

Figs. 18–19. Female from the Huachuca Mts.




THREE NEW ARGIAS.

See p. 260.

## THE HEATH COLLECTION OF LEPIDOPTERA.

BY J. B. WALLIS, WINNIPEG, MAN.

(Continued from Vol. XLIX, page 229.)

### Limacodidæ.

4445 *Tortricidia testacea* Pack.

### Thyridæ.

4471 *Thyris lugubris* Bdv.

### Cossidæ.

4482 *Cossus (Acossus) centerensis* Lint.
4483 " " *populi* Walk.
4487 *Prionoxystus robiniæ* Peck.

### Sesiidæ.

4523 *Bembecia marginata* Harr.

Many of the "Micros" had been identified by Mr. Kearfott. Unfortunately the names had been taken off the specimens and placed behind series often containing several species. Some of these were identified by comparison with specimens in my collection, identified by Mr. Kearfott. The remainder were sent to Mr. Busck who kindly went over them.

### Pyralidæ.

4640 *Desmia funeralis* Hbn.
4703 *Evergestis straminalis* Hbn.
4709 *Nomophila noctuella* Schiff.
4714 *Loxostege chortalis* Grt.
4725 " *sticticalis* Linn.
4726 " *commixtalis* Wlk.
4748 *Diosemia plumbosignalis* Fern.
4769 *Peripasta cæculalis* Zell.
4770 *Phlyctænia ferrugalis* Hbn.
4773 " *itysalis* Wlk.
4779 " *terrealis* Tr.
4782 " *tertialis* Gn.
4789 *Pyrausta thestealis* Wlk.
4792 " *oxydalis* Gn. Probably.

4805 *Pyrausta fumalis* Gn.
4811 " *fumoferalis* Hulst.
4812 " *unifascialis* Pack.
4814 " *fodinalis* Led.
4816 " *perrubralis* Pack.
" *ochosalis* Dyar.
4824 " *generosa* G. & R.
4837 " *nicalis* Grt.
4842 " *funebris* Strom.
4858 *Nymphula icciusalis* Wlk.
4863 " *badiusalis* Wlk.
4866 " *maculalis* Clem.
4881 *Scoparia centuriella* Schiff.
4888 *Pyralis farinalis* Linn.
4895 *Herculia himonialis* Zell. This, according to Drs. Barnes & McDunnough is an abberation of *olinalis* Gn.
4913 *Schœnobius unipunctellus* Rob.
4916 " *tripunctellus* Rob.
4917 " *mellinellus* Clem.
4917b " *albicostellus* Fern.
4918 " *clemensellus* Rob.
4936 *Crambus pascuellus* Linn.
4939 " *unistriatellus* Pack.
4940 " *præfectellus* Zinck.
4953 " *perlellus* Scop. (*innotatellus* Wlk.)
4958 " *vulgivagellus* Clem.
4960 " *ruricolellus* Zell.
" *dorsipunctellus* Kearf.
4974 " *mutabilis* Clem.
4977 " *trisectus* Wlk.
4980 " *caliginosellus* Clem.
4982 " *luteolellus* Clem.
*Thaumotopsis fernaldellus* Kearf.
4995 *Argyria auratella* Clem.
5000 *Diatræa idalis* Fern.
5004 *Chilo comptulatalis* Hulst.
5079 *Mineola tricolorella* Grt.
5108 *Ambesa lætella* Grt.

5110 *Ambesa niviella* Hulst.
5127 *Meroptera pravella* Grt.
5150 *Salebria basilaris* Zell.
5155 " *purpurella* Hulst. (*Myrlæa delassalis* Hulst.)
5159 *Laodamia fusca* Haw.
5175 *Epischnia albiplagiatella* Pack.
5176 " *boisduvaliella* Gn.
5185 *Megasis atrella* Hulst.
5189 *Lipographis leoninella* Pack.
5232 *Hulstia undulatella* Clem.
5258 *Homœosoma uncanale* Hulst.
5270 *Moodna ostrinella* Clem.
5300 *Peoria approximella* Wlk.

**Pterophoridæ.**

5326 *Platyptilia cosmodactyla* Hbn. In the collection as *punctidactyla* Haw., which is a synonym.
*Platyptilia pallidactyla* Haw.
5351 *Pterophorus homodactylus* Wlk.
5352 " *brucei* Fern.
5370 " *monodactylus* Linn.

**Tortricidæ.**

5424 *Exartema fasciatanum* Clem.
5427 " *inornatanum* Clem.
5434 *Olethreutes* (*Argyroploce*) *nimbatana* Clem.
5436 " " *capreana* Hbn.
5437 " " *dimidiana* Sodoff.
5444 " " *hemidesma* Zell.
5452 " " *duplex* Wlsm.
5453 " " *nubilana* Clem.
5460 " " *constellatana* Zell.
5467 " " *instrutana* Clem.
5469 " " *campestrana* Zell.
5474 " " *bipartiana* Clem.
5489 *Eucosma morrisoni* Wlsm.
5493 " *ridingsana* Rob.
5496 " *circulana* Hbn.
5503 " *agricolana* Wlsm.

5528 *Eucosma culminana* Wlsm.
5532 " *juncticiliana* Wlsm.
" *confluana* Kearf. A form of *dorsisignatana* Clem.
" *heathiana* Kearf.
" *pallidicostana* Wals.
" *annetteana* Kearf.
" *imbrifiana* Dyar. Probably.
" *costastrigalana* Kearf.
" *bilineana* Kearf.
" *tenuiana* Wals.
" *awemeana* Kearf.
" *umbrastriana* Kearf.
5552 " *illotana* Wlsm.
5559 " *dorsisignatana* Clem.
5573 *Cydia radiatana* Wlsm.
" *dorsiatomana* Kearf.
" *pseudotsugana* Kearf.
" *triangulana* Kearf.
5633 *Epinotia fasciolana* Clem.
5654 *Ancylis mediofasciana* Tr.
5655 " *nubeculana* Clem.
5663 " *burgessiana* Zell.
5718 *Acleris subnivana* Wlk.
5722 " *nigrolinea* Rob. Probably.
5726 " *hastiana* Linn.
5740 " *cervinana* Fern.
5752 *Cenopis reticulatana* Clem.
5756 " *groteana* Fern.
*Sparganothis idæusalis* Wlk.
5765 *Sparganothis puritana* Rob.
5766 " *xanthoides* Wlk.
5767 " *irrorea* Rob.
" *vocaridorsana* Kearf.
5773 *Archips rosaceana* Harr.
5774 " *purpurana* Clem.
5777 " *cerasivorana* Fitch.
5796 " *persicana* Fitch.
5804 *Platynota sentana* Clem.

*Pandemis canadana* Kearf.
5811 *Tortrix alleniana* Fern.
5816 " *quercifoliana* Fitch.
5826 " *conflictana* Wlk.
5827 " *osseana* Scop.
" *clemensiana* Fern.
5829 " *argentana* Clerck.
5840 *Eulia triferana* Wlk.
5851 *Phalonia vitellinana* Zell.
5892 *Hysterosia inopiana* Haw.
" *cartwrightiana* Kearf.
" *merrickana* Kearf.

**Yponomeutidæ.**

6033 *Harpipteryx canariella* Wlsm.
6034 " *dentiferella* Wlsm.
6035 " *frustella* Wlsm.

**Gelechiidæ.**

6164 *Gnorimoschema gallæsolidaginis* Riley.
6226 *Gelechia lugubrella* Fab.
6254 " *ornatifimbriella* Clem.
6262 " *pseudoacaciella* Cham.
6335 *Trichotaphe flavocostella* Clem.
6344 " *setosella* Clem.

**Xylorictidæ.**

6380 *Stenoma algidella* Wlk.

**Œcophoridæ.**

6402 *Depressaria arnicella* Wlsm. Probably.
6403 " *argillacea* Wlsm.
6404 " *sanguinella* Busck.
6409 " *novimundi* Wlsm.
6412 " *ciniflonella* Zell. Probably.
6421 " *canadensis* Busck. Probably.
" *juliella* Busck.
" (*Agnopteryx*) *flavicomella* Engel.
" " *walsinghamiella* Busck. According to the new list a synonym of *fernaldella* Wlsm.

6436 *Semioscopsis packardella* Clem.
6438 " *aurorella* Dyar.
6439 " *megamicrella* Dyar.
6440 " *inornata* Wlsm.
6443 *Ethmia fuscipedella* Wlsm.

**Elachistidæ.**

*Mompha claudiella* Kearf.

**Tineidæ.**

7024 *Tineola bisselliella* Hum. Probably.
7026 *Monopis biflavimaculella* Clem.
7030 " *monachella* Hbn.

**Hepialidæ.**

7150 *Sthenopis argenteomaculatus* Harr. Probably.
7151 " *quadriguttatus* Grt. Probably. A study of our Manitoban forms of *Sthenopis* is desirable.

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## ECOLOGICAL NOTES ON THE SPRING CANKER WORM (*PALEACRITA VERNATA*, PECK).

BY B. P. YOUNG, CORNELL UNIVERSITY, ITHACA, N.Y.

During the past few years the elm trees of Lawrence, like those of many other Kansas municipalities have suffered materially from infestations by the spring canker worm, *Paleacrita vernata*, Peck. In fact, the large increase in numbers of this insect during the spring of 1916 seemed to foretell the impending danger of a worse devastation the next season and brought about a co-operative move on the part of the citizens to control the pest. Early in February, 1917, the city commissioners banded all elm trees, and other trees adjacent, as well as poles, with tar paper and tanglefoot, both in yards and on terraces in front. The cost of this work, combined with that of keeping the tanglefoot sticky during the season of emergence, was charged to the various taxpayers concerned.

Realizing the advantages of such conditions for an ecological study of the pest, the writer, while associated with the Department of Entomology of the University of Kansas, chose a district in which the trees had been completely defoliated the previous year and carried on the experiment outlined below.

The initial objects of the experiment were (1) the determination of the minimum temperature at which adults would emerge from the ground; (2) the average number of eggs laid by each female; (3) the incubation period; (4) the lowest temperature at which eggs would hatch, and (5) the percentage of sterility among eggs. Incidentally other interesting results were obtained.

On February 27th and on each of the twenty-five succeeding days which were warm enough to permit the emergence of adults from the ground, 100 female moths were collected from the trunks of a certain group of eight trees, either from the free portion below the bands or from the cotton beneath the bands. On two days, the 4th and 5th of March, the temperature became prohibitive to the emergence of the females, and on the 6th of the same month two separate increments were taken as a check upon each other, thus basing the results of the experiment upon the activities of 2,500 females.

Each increment of 100 females was taken to the insectary and placed immediately in a wide-mouthed, four-ounce bottle, containing a loose roll of cheesecloth. The mouth was then covered with the same material and the bottle kept under ordinary inside conditions of temperature, humidity, etc.

On each succeeding day, including the fourth, the eggs were scraped from the cheesecloth roll and weighed on a balance, accurate to milligrams. These eggs were then placed in separate vials, plugged with cotton, and placed outside a west window of the insectary office in a window box. All eggs deposited after the fourth day of confinement up to the time of death of all females were weighed together and placed in the fifth vial of a series of five.

In order to determine the average number of eggs to the milligram two large masses of eggs, especially free from foreign particles, were counted. Knowing the weight in milligrams and the total number of eggs in each, the desired average was readily computed. These two counts gave results so nearly identical that it was decided that the consideration of other masses was unnecessary, and an average of the results obtained in these two cases was used throughout the experiment.

Vials containing eggs were examined from day to day and

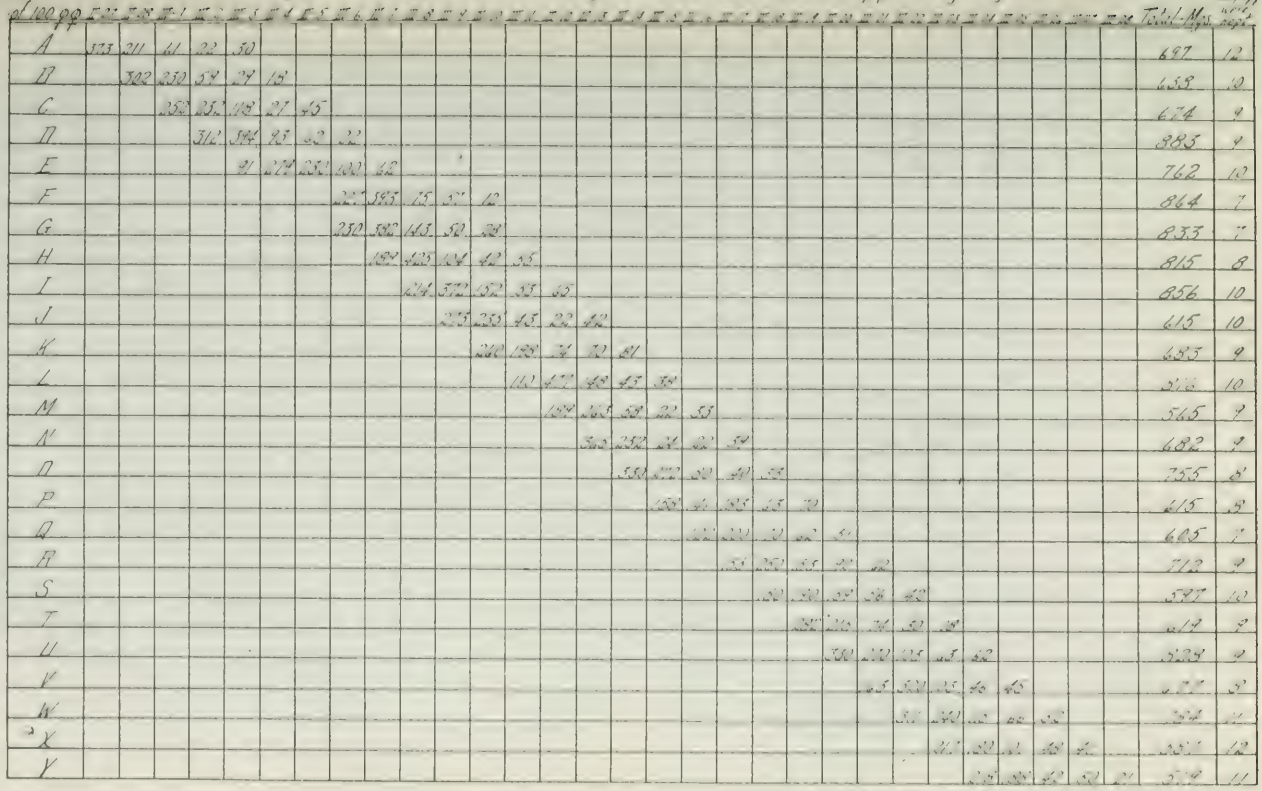
Measurements
Milligrams of eggs deposited by 100 Paleacrita vernata ♀♀ during night of –
No. of ♀♀
Total Mgs.
Average Mgs.

Fig. 10—Data

were recorded as hatching when at least twenty-five larvæ had emerged. Oftentimes one or two larvæ would appear in a vial several days before the majority of the eggs were ready to hatch.

For the determination of the percentage of sterility in the eggs, those oviposited by ten different increments of 100 females were used, giving in all 50 vials of eggs. The number of eggs failing to hatch when compared with the total number of eggs in a vial gave the percentages of sterile and fertile eggs therein.

Furthermore, 25 females were taken from the sticky bands to see what effect the tanglefoot on the body of the insect would have upon the number of eggs deposited.

Observations upon the number of males and females emerging from a very limited area were ascertained by placing a light-tight box over this surface and counting those coming up within. By placing a shell vial in a cornucopia-shaped piece of cardboard in the side of the box the adults emerging would seek the light of the vial and could be counted from day to day. Unfortunately, the possibilities of this phase of the experiment presented themselves too late for the collection of sufficient data upon which to base definite conclusions. It would be interesting to learn whether the relative proportion of males to females differs materially during the season of emergence.

Average indoor temperatures were secured from a self-recording thermometer by averaging the twelve hourly readings during the day and night, respectively.

Outdoor mean day and night temperatures were computed from the daily readings taken by the physics department at 7 a.m., 2 p.m., and 7 p.m. The mean night temperature was assumed to be the average of the readings of the thermometer at 7 p.m. and 7 a.m. The mean day temperature, however, was not so easily obtained, but by giving the 2 p.m. reading double significance, as this was probably the highest daily temperature reading, and using this reading with those at 7 a.m. and 7 p.m. a fair average was secured. Thus, in order to compute the mean day temperature on March 25, '17, which showed the following readings: 7 a.m., 43°; 2 p.m., 69.5°; and 7 p.m., 64°, we would add 43,69.5, 69.5, and 64 and divide by four, getting 61.5°.

Fig. 10 is primarily a data sheet. Here the letters of the alphabet are used to designate the several increments of 100 females collected. The groups of figures extending diagonally across the plate represents milligrams of eggs deposited on successive nights from February 27th until March 24th, inclusive. The first four figures of each horizontal row indicate the deposits of a single increment during the first four nights in the insectary; the fifth, all after the fourth night until the entire increment of 100 females was dead. The last vertical column represents, in days, the length of time each increment was kept; the column next to this the total number of milligrams of eggs deposited by each increment. A grand total of the eggs deposited by the 2,500 females appears below as well as the average number of days the insects were kept before all were dead.

The number of eggs to the milligram was computed by counts made of the eggs deposited by increments *O* and *R* on the nights of March 14th and 18th, respectively, these masses being exceptionally free from foreign particles. The count on the former, weighing 330 milligrams was 3,851 or 11.67 eggs to the milligram; that on the latter, weighing 250 milligrams, was 2,930 or 11.72 eggs to the milligram. These results were considered close enough to warrant the adoption of 11.7 to be used as a multiplier in changing milligrams to number of eggs.

Table III shows the number of eggs considered in computing the incubation period for different parts of the season, together with the total number of eggs upon which was based the determination of the average number of days spent in the egg stage.

Table IV gives the data upon which the calculation of the average percentage of fertility of the eggs depends. In each case the letter in the first vertical column specifies the particular increment whose total number of eggs deposited during each successive night is designated and totalled; whose sterile eggs deposited during each successive night is recorded and totalled; and the computed percentage of sterile eggs for each night's deposit appears with its average. At the bottom of the table appear grand totals which show an almost identical percentage of sterility in the first two nights' deposits with an increase thereafter approximating a geometrical ratio.

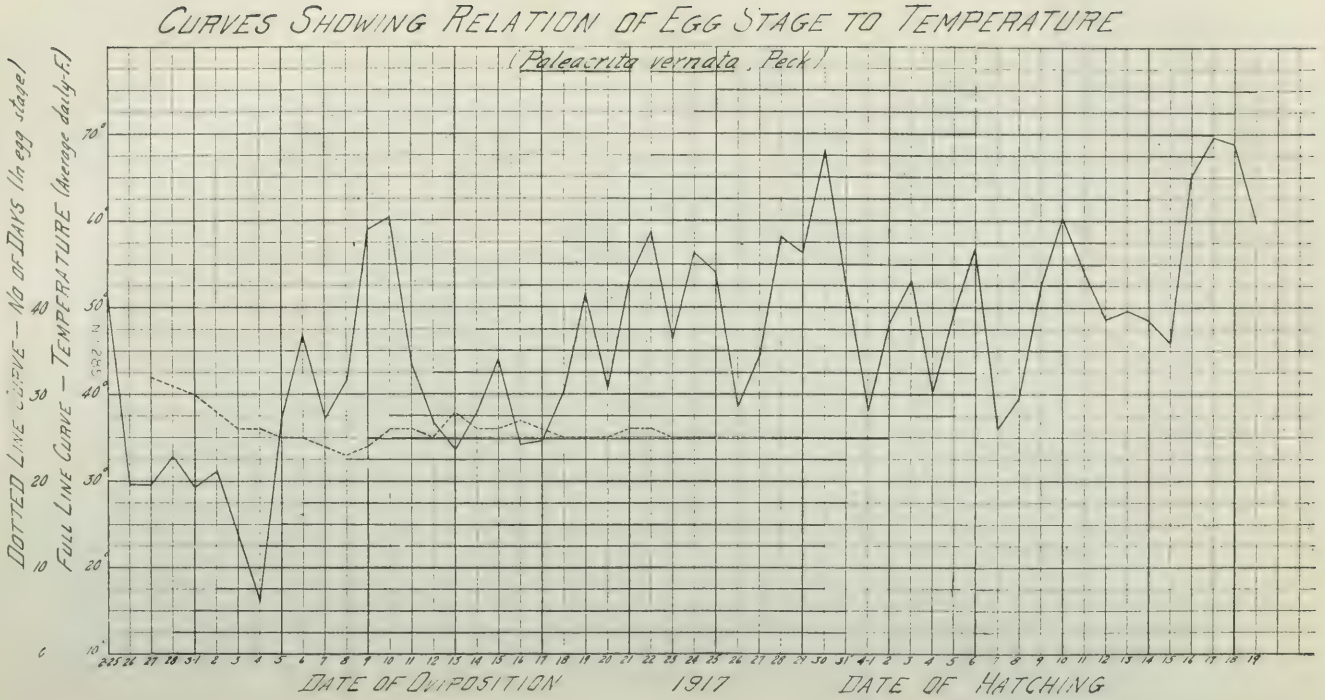
CURVES SHOWING RELATION OF EGG STAGE TO TEMPERATURE
(Paleacrita vernata, Peck)
DOTTED LINE CURVE — NO. OF DAYS (In egg stage)
FULL LINE CURVE — TEMPERATURE (Average daily F.)
DATE OF OVIPOSITION
1917
DATE OF HATCHING

Fig. 11

The relation of the duration of the egg stage to outdoor temperatures is shown graphically in Fig. 11. The full line temperature date curve was plotted by using the average daily outdoor temperatures as ordinates and the dates as abscissæ; the broken line egg-stage-date of oviposition curve, by using the incubation period as ordinates and dates of oviposition as abscissæ. On the same plate the parallel transverse lines represent the incubation periods of eggs laid at different times during the season; the left end indicating the date of oviposition and the right that of hatching.

Passing now to the consideration of results it seems best to discuss first the reasonably definite conclusions and later those which might be termed suggestive.

The females began to oviposit during the second night after emergence from the ground, if we assume that most of the moths collected each day emerged the evening of the preceding day. Or, in other words, they began to oviposit during the first night in captivity. The relative percentages of eggs laid during each day following collection are: 1st, 32.93%; 2nd, 38.4%; 3rd, 15.64%; 4th, 7%; during remaining period of life, 6.03%. It is interesting to note that 71.33% of all eggs deposited appeared during the first two nights after the moths were collected.

The average number of eggs deposited by each female under the conditions of the experiment was surprisingly low. The 17,681 milligrams of eggs deposited by 2.500 females means only an average of 82.7 eggs apiece, which when contrasted with figures running as high as 400 given by dissections as well as by standard texts, seems hard to account for. In all probability the females of this species, like those of many others among insects, normally fail to deposit all the eggs of which they are capable or possibly some sterile females die before leaving a single mass of eggs.

Turning to the figures on the percentage of sterility of eggs we find the following averages for all laid during the various nights in captivity: 1st, 10.8%; 2nd, 11.2%; 3rd, 22.4%; 4th, 46.7%; and thereafter, 82.8%, with a general average of 19.15% sterility. Therefore, if the average females lay 82.7 eggs and 19.15% of these are sterile we can say, disregarding all other casualty factors,

that each emerging female will ordinarily start sixty-eight larvæ on their perilous life cycles.

The longest incubation period for any egg mass was found to be 32 days, the shortest 23, with an average of 26 days. Undoubtedly, as is to be expected, temperature plays an important role in the determination of this period, for eggs exposed to the sun, on account of a crack in the window box, under the identical conditions of others in other respects, hatched at least two or three days before those better protected from its rays.

The average number of days the females lived after being taken was about nine, although individuals varied widely in this respect.

Considering now some of the suggestive results we find good reasons for believing that the temperature prohibitive to the emergence of females is between 20 and 25° F. During the first four days of the experiment the average daily temperature remained steadily below freezing, about 30° F., and females were found in abundance, but during the fifth night the temperature dropped to 18° and as a result it was impossible to secure the moths either the next day or the following, which was preceded by a night even colder, but on the third day thereafter, following a decided rise in temperature during the previous day and night, plenty of moths were taken. The temperature of the fifth night was assumed to be that critical to the emergence of the females.

A study of Plate II shows no eggs hatching on April 1st, 4th, 7th, 8th and 15th at temperatures of 38, 40, 36, 39½ and 46 degrees respectively, but on the other hand on April 2nd, 5th, 12th, 13th and 14th they are shown to have hatched at temperatures as low as 48½, 50, 49, 49½ and 48½ degrees. Based upon the above figures an average daily temperature around 45° F. might be considered as that fatal to the hatching of eggs in the ordinary run of weather.

The count made upon the males and females emerging under a single light-tight box, 17 x 25½ inches in area, showed 34 males and 11 females, or approximately 75% of the whole number were of the winged sex.

On March 20th aside from the usual 100 normal females, 25 were taken from the tanglefoot bands, each having a certain amount

of this sticky material on its abdomen. Comparing the 33 milligrams of eggs laid by the latter 25 females with 828 milligrams by the above-mentioned 100 females, we find that in case a moth is able to drag herself through the sticky band and go on up the tree she is not likely to deposit more than 16% as many eggs as she would otherwise have done under normal conditions. The conclusion to be drawn is that even those bands which do not keep the moths away from the lower branches are somewhat effective.

It was found by isolating individuals that eggs are not all deposited at one time but may be laid in at least four different masses. Almost always sterile eggs appeared bunched together, as if from one female and not a few here and there, mixed with fertile ones.

In conclusion, we might add one more suggestion gathered from the data on the fertility of eggs, Table IV. It would seem from the consideration of the uniformity which the grand total of the number of sterile eggs indicates for each succeeding night, when compared with the pronounced dropping off in the total number of eggs laid after the second night, that the sterile females retain their eggs as long as possible, while most of the fertile females oviposit during the first or second nights after emergence.

Results of similar experiments in other localities would be interesting for comparison.

TABLE I.

MEAN TEMPERATURES (FAHRENHEIT DEGREES).

INSECTARY OFFICE. 1917.

| Date | Day | Night | Date | Day | Night |
|---|---|---|---|---|---|
| February 27 | 82.0 | 80.0 | March 18 | 70.0 | 62.5 |
| " 28 | 79.0 | 80.0 | " 19 | 77.5 | 82.0 |
| March 1 | 81.0 | 76.0 | " 20 | 85.25 | 81.0 |
| " 2 | 77.0 | 78.0 | " 21 | 79.0 | 79.5 |
| " 3 | 80.5 | 76.67 | " 22 | 83.5 | 84.0 |
| " 4 | 64.0 | 71.0 | " 23 | 78.5 | 74.25 |
| " 5 | 72.0 | 76.0 | " 24 | 73.25 | 76.75 |
| " 6 | 83.0 | 69.5 | " 25 | 73.5 | 69.0 |
| " 7 | 73.5 | 75.5 | " 26 | 69.0 | 67.0 |
| " 8 | 82.0 | 83.0 | " 27 | 72.5 | 74.5 |
| " 9 | 84.5 | 83.5 | " 28 | 76.5 | 87.5 |
| " 10 | 81.0 | 86.5 | " 29 | 86.5 | 83.0 |
| " 11 | 70.5 | 62.0 | " 30 | 82.25 | 83.17 |
| " 12 | 75.0 | 77.0 | " 31 | 80.25 | 80.5 |
| " 13 | 75.0 | 73.33 | April 1 | 70.0 | 71.0 |
| " 14 | 80.33 | 81.33 | " 2 | 70.0 | 72.83 |
| " 15 | 81.5 | 87.5 | " 3 | 77.75 | 81.5 |
| " 16 | 74.0 | 70.0 | " 4 | 78.33 | 73.33 |
| " 17 | 76.33 | 74.0 | " 5 | 76.5 | 83.75 |

TABLE II.

OUTDOOR TEMPERATURES (FAHRENHEIT DEGREES).

1917.

| Date | 7 a.m. | 2 p.m. | 7 p.m. | Mean day | Mean night | Average daily |
|---|---|---|---|---|---|---|
| February 25 | 36.0 | 65.0 | 59.0 | 56.25 | 46.0 | 51.12 |
| " 26 | 33.0 | 37.0 | 29.5 | 34.0 | 25.25 | 29.62 |
| " 27 | 21.0 | 39.5 | 32.0 | 33.0 | 26.25 | 29.62 |
| " 28 | 20.5 | 44.0 | 36.5 | 36.25 | 29.25 | 32.75 |
| March 1 | 22.0 | 36.5 | 29.5 | 31 0 | 27.75 | 29.37 |
| " 2 | 26.0 | 39.0 | 31.5 | 34.0 | 28.5 | 31.25 |
| " 3 | 25.5 | 31.5 | 28.5 | 29.25 | 18.25 | 23.75 |
| " 4 | 9.0 | 22:0 | 19.0 | 18.0 | 14.5 | 16.25 |
| " 5 | 9.5 | 40.0 | 44.0 | 33.0 | 41.25 | 37.12 |
| " 6 | 38.5 | 56.5 | 51.5 | 50.75 | 42 75 | 46.75 |
| " 7 | 34.0 | 44.0 | 40.0 | 40.5 | 33.75 | 37.12 |
| " 8 | 27.5 | 53.0 | 47.5 | 45.25 | 37.75 | 41.5 |
| " 9 | 32.5 | 69.0 | 62.5 | 57.0 | 60.75 | 58.87 |
| " 10 | 59.0 | 73.5 | 70.0 | 69.0 | 51.75 | 60.37 |
| " 11 | 33.5 | 52.0 | 47.0 | 46.0 | 41.25 | 43.62 |
| " 12 | 35.5 | 40.5 | 37.0 | 38.5 | 35.0 | 36.75 |
| " 13 | 33.0 | 37.0 | 35.5 | 35.5 | 31.75 | 33.62 |
| " 14 | 28.0 | 44.5 | 41.0 | 39.5 | 35.0 | 37.75 |
| " 15 | 29.0 | 55.0 | 46.0 | 46.25 | 41.75 | 44.0 |
| " 16 | 37.5 | 38.0 | 34.0 | 37.0 | 31.5 | 34.25 |
| " 17 | 29.0 | 38.0 | 34.5 | 35.0 | 34.5 | 34.75 |
| " 18 | 34.5 | 43.0 | 41.0 | 40.5 | 40.25 | 40.37 |
| " 19 | 39.5 | 65.0 | 54.4 | 56.0 | 46.75 | 51.37 |
| " 20 | 39.0 | 46.5 | 43.0 | 43.75 | 37.5 | 40.62 |
| " 21 | 32.0 | 63.5 | 57.0 | 54.0 | 52.5 | 53.25 |
| " 22 | 48.0 | 77.5 | 66.0 | 67.25 | 50.5 | 58.69 |
| " 23 | 36.5 | 54.5 | 50.0 | 49.0 | 43.75 | 46.37 |
| " 24 | 37.5 | 66.5 | 61.5 | 60.5 | 52.25 | 56.37 |
| " 25 | 43.0 | 69.5 | 64.0 | 61.5 | 46.5 | 54.0 |
| " 26 | 39.0 | 46.0 | 42.5 | 43.5 | 33.75 | 38.62 |
| " 27 | 25.0 | 53.0 | 47.5 | 44.5 | 44.25 | 44.37 |
| " 28 | 41.0 | 73.0 | 64.5 | 63.0 | 53.25 | 58.12 |
| " 29 | 42.0 | 66.0 | 56.0 | 57.5 | 55.0 | 56.25 |
| " 30 | 54.0 | 79.5 | 75.5 | 72.0 | 64.0 | 68.0 |
| " 31 | 52.0 | 59.5 | 54.0 | 56.25 | 48.0 | 52.12 |
| April 1 | 42.0 | 40.5 | 39.0 | 40.5 | 35.75 | 38.12 |
| " 2 | 32.5 | 55.0 | 50.5 | 48.25 | 48.25 | 48.25 |
| " 3 | 46.0 | 58.5 | 57.5 | 55.12 | 51.25 | 53.19 |
| " 4 | 45.0 | 41.0 | 41.0 | 42.0 | 38.25 | 40.12 |
| " 5 | 35.5 | 55.0 | 53.0 | 49.62 | 49.25 | 49.44 |
| " 6 | 45.5 | 65.0 | 62.0 | 59.37 | 54.25 | 56.81 |
| " 7 | 46.5 | 39.0 | 32.5 | 39.25 | 32.75 | 36.0 |
| " 8 | 33.0 | 48.0 | 40.5 | 42.37 | 36.5 | 39.44 |
| " 9 | 32.5 | 60.5 | 57.5 | 52.75 | 52.25 | 52.5 |
| " 10 | 47.0 | 71.0 | 64.5 | 63.37 | 57.25 | 60.31 |
| " 11 | 50.0 | 65.0 | 58.0 | 59.5 | 48.75 | 54.12 |
| " 12 | 44.5 | 54.0 | 52.5 | 51.25 | 46.0 | 48.62 |
| " 13 | 39.5 | 59.5 | 51.0 | 52.37 | 47.0 | 49.69 |
| " 14 | 43.0 | 56.0 | 51.5 | 51.62 | 45.25 | 48.58 |
| " 15 | 39.0 | 45.0 | 44.0 | 43.25 | 48.5 | 45.87 |
| " 16 | 53.0 | 71.0 | 70.0 | 66.25 | 64.0 | 65.12 |
| " 17 | 58.0 | 77.0 | 73.5 | 71.37 | 68.0 | 69.69 |
| " 18 | 62.5 | 77.5 | 72.0 | 72.37 | 65.5 | 68.94 |
| " 19 | 59.0 | 70.0 | 65.0 | 66.0 | 53.5 | 59.75 |

TABLE III. INCUBATION PERIOD. (PALEACRITA VERNATA).

| Number of eggs considered | Oviposited | Hatched | Number of days in egg stage |
|---|---|---|---|
| 4,364 | II–27–'17 | III–31–'17 | 32 |
| 5,288 | II–28–'17 | III–31–'17 | 31 |
| 2,948 | III– 1–'17 | III–31–'17 | 30 |
| 3,650 | III– 2–'17 | III–30–'17 | 28 |
| 4,610 | III– 3–'17 | III–29–'17 | 26 |
| 3,264 | III– 4–'17 | III–30–'17 | 26 |
| 2,591 | III– 5–'17 | III–30–'17 | 25 |
| 6,507 | III– 6–'17 | III–31–'17 | 25 |
| 11,279 | III– 7–'17 | III–31–'17 | 24 |
| 4,973 | III– 8–'17 | III–31–'17 | 23 |
| 4,411 | III– 9–'17 | IV– 2–'17 | 24 |
| 7,570 | III–10–'17 | IV– 5–'17 | 26 |
| 2,820 | III–11–'17 | IV– 6–'17 | 26 |
| 6,447 | III–12–'17 | IV– 6–'17 | 25 |
| 7,348 | III–13–'17 | IV–10–'17 | 28 |
| 3,861 | III–14–'17 | IV– 9–'17 | 26 |
| 3,463 | III–15–'17 | IV–10–'17 | 26 |
| 3,077 | III–16–'17 | IV–12–'17 | 27 |
| 6,295 | III–17–'17 | IV–12–'17 | 26 |
| 4,914 | III–18–'17 | IV–12–'17 | 25 |
| 5,090 | III–19–'17 | IV–13–'17 | 25 |
| 8,237 | III–20–'17 | IV–14–'17 | 25 |
| 5,932 | III–21–'17 | IV–16–'17 | 26 |
| 7,383 | III–22–'17 | IV–17–'17 | 26 |
| 5,347 | III–23–'17 | IV–17–'17 | 25 |
| 6,002 | III–24–'17 | IV–18–'17 | 25 |
| 2,200 | III–25–'17 | IV–19–'17 | 25 |
| 139,871 | Total | Average | 26 |

TABLE IV. OVIPOSITED.

| Increments of 100 ♀ ♀ | Data | 1st night | 2nd night | 3rd night | 4th night | Thereafter | Totals |
|---|---|---|---|---|---|---|---|
| A | 1. Total number of eggs... | 4,364 | 2,469 | 714 | 257 | 351 | 8,155 |
| | 2. Number of sterile eggs.. | 480 | 494 | 251 | 117 | 310 | 1,652 |
| | 3. Pctge. of sterile eggs..... | 11 | 20 | 35.2 | 45.5 | 88.3 | 20.2 |
| D | 1. See same number above | 3,650 | 4,610 | 1,088 | 725 | 257 | 10,330 |
| | 2. " " | 341 | 707 | 256 | 204 | 132 | 1,640 |
| | 3. " " | 9.3 | 15.3 | 23.5 | 27.8 | 51.4 | 15.9 |
| E | 1. " " | 1,065 | 3,264 | 2,691 | 1,170 | 726 | 8,916 |
| | 2. " " | 222 | 303 | 431 | 605 | 537 | 2,098 |
| | 3. " " | 19.9 | 9.3 | 16.6 | 51.7 | 74 | 23.6 |
| F | 1. " " | 2,656 | 4,595 | 2,048 | 667 | 139 | 10,105 |
| | 2. " " | 140 | 374 | 507 | 347 | 108 | 1,476 |
| | 3. " " | 5.3 | 8.1 | 24.7 | 52 | 77.7 | 14.6 |
| I | 1. " " | 2,504 | 4,352 | 1,778 | 620 | 760 | 10,014 |
| | 2. " " | 179 | 576 | 347 | 251 | 581 | 1,934 |
| | 3. " " | 7.1 | 13.2 | 19.5 | 40.5 | 76.4 | 19.3 |
| L | 1. " " | 1,287 | 5,251 | 1,732 | 503 | 445 | 9,218 |
| | 2. " " | 135 | 476 | 298 | 189 | 402 | 1,500 |
| | 3. " " | 10.5 | 9.1 | 17.2 | 37.6 | 90.4 | 16.3 |
| M | 1. " " | 2,211 | 3,077 | 679 | 257 | 386 | 6,610 |
| | 2. " " | 906 | 394 | 205 | 167 | 350 | 2,022 |
| | 3. " " | 41 | 12.8 | 30.2 | 65 | 90.7 | 30.6 |
| U | 1. " " | 3,861 | 2,708 | 1,205 | 737 | 725 | 9,236 |
| | 2. " " | 280 | 293 | 361 | 434 | 682 | 2,050 |
| | 3. " " | 7.3 | 10.8 | 29.9 | 58.9 | 94.1 | 22.2 |
| W | 1. " " | 3,639 | 2,808 | 1,346 | 772 | 578 | 9,143 |
| | 2. " " | 215 | 171 | 311 | 407 | 540 | 1,644 |
| | 3. " " | 5.9 | 6.1 | 23.1 | 52.7 | 93.4 | 18 |
| Y | 1. " " | 2,551 | 2,200 | 491 | 585 | 252 | 6,079 |
| | 2. " " | 94 | 183 | 123 | 219 | 184 | 803 |
| | 3. " " | 3.7 | 8.3 | 25.1 | 37.4 | 73 | 13.2 |
| Grand total for 10 increments of 100 ♀ ♀ | 1. " " | 27,788 | 35,334 | 13,772 | 6,293 | 4,619 | 87,806 |
| | 2. " " | 2,992 | 3,971 | 3,090 | 2,940 | 3,826 | 16,819 |
| | 3. " " | 10.8 | 11.2 | 22.4 | 46.7 | 82.8 | 19.15 |

Total number of eggs deposited by 10 increments of 100 ♀ ♀ each..... 87,806
Total number of sterile eggs..... 16,819
Percentage of sterile eggs..... 19.15
Percentage of fertile eggs..... 81.85

# THE DORSAL PYGIDIAL GLANDS OF THE FEMALE COCKROACH, BLATTELLA GERMANICA.*

BY E. H. DUSHAM, ITHACA, N.Y.

While engaged in the study of the body wall of the cockroach, the writer's attention was attracted by peculiar and previously unnoted structures on the dorsal side of the 10th abdominal segment of the female. These are represented in Fig. 1. D. They consist of three groups of depressions in the cuticula at the very anterior portion of the segment, one large group at the centre, and a smaller group on each side of this. These depressions are of various sizes, the larger ones, however, being found in the middle group.

In fresh material, these structures are not visible from the dorsal side, being covered by the posterior part of the 9th segment. However, by stretching the intersegmental membrane between these two segments, the depressions are readily observed, especially in material which has been boiled in potash and stained with Eosin or Gentian Violet.

Under the oil immersion lens it will be seen that the smallest depressions are single, and contain a single pore at the centre (Fig. 2). The larger depressions on the other hand include numerous smaller depressions, the number ranging from two to twenty, according to the size of the depression. Each of these smaller depressions likewise has at its centre a single pore. Viewed from the surface it will be seen (Fig. 2) that the smaller depressions with their pores at the centre, appear as well defined areas, simulating somewhat the areas which characterize the surface of the cuticula in other regions of the body. In cross-section (Fig. 3) it will be seen that what appear as lines dividing the different areas when viewed from the dorsal surface, are in reality smaller ridges. It will also be noted that the pores extend through both layers of the cuticula.

The presence of pores in the cuticula indicated that glandular structures were present in that region. Accordingly cross and longitudinal sections were made through these parts, varying in

*Contribution from the Entomological Laboratory of Cornell University.
August, 1918

thickness from three to ten micra. Dietrich's, Bouins', and Fleming's (strong formula) Fluids were used for fixation. Best results were obtained with the last fluid, although Dietrich's Fluid gave excellent results. Sections were stained with Heidenhain's Iron Haematoxylin and Delafield's Haematoxylin with Eosin used as a counterstain. Better results were obtained with the former stain, especially after fixation with the Fleming's Fluid.

Cross and longitudinal sections through the region of the pores, showed that the hypodermis was very much thickened, and apparently consisted of several layers of cells (Figs. 4 and 5). The upper layer consisted of hypodermal cells with elongate, flattened, deeply stained nuclei, with axes parallel to the surface of the cuticula, and surrounded by but little cytoplasm. They resemble the normal hypodermal cells found in other regions of the body, but are not so regularly arranged nor contiguous, being scattered here and there between the upper ends of the cells of the lower layers.

Below these smaller cells, larger cells were present, sometimes appearing as a single layer, at other times presenting the appearance of two or more layers, due to the fact that they were crowded together so that their nuclei had been somewhat displaced. Longitudinal sections showed that these lower cells were not perpendicular to the surface of the cuticula, but slanted backwards at a considerable angle. They are somewhat columnar in shape, but vary much in this respect due to their being crowded together.

The minute structure of these cells is represented by figures 6 and 7. They possess large vesicular nuclei with distinct nuclear walls, prominent nucleoli, and deeply-stained chromatin granules. The cytoplasm of the individual cells is distinctly areolar in appearance. The most striking feature about these cells though is the presence in the cytoplasm of a rounded reservoir from which extends a delicate chitinous canal which opens at the surface by one of the pores previously described. The reservoir may be either laterad or somewhat beneath the nucleus, and the canal in many cases is quite sinuous, so that in sections, only portions of it show here and there. Surrounding the reservoir the cytoplasm

is much more granular, the granules evidently being the secretion which collects in that region, and empties into the reservoir. From here the secretion is carried to the exterior through the minute canals, where it collects in the depressions in the cuticula.

What the nature of this secretion is, the writer did not determine. From the structure of the glands, and their resemblance to odoriferous glands of other insects, the writer is inclined to believe they perform a similar function in the case of the cockroach.

The writer wishes to express his thanks to Dr. W. A. Riley for his suggestions and advice in this work.

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Explanation of Plate VI.

Fig. 1. Dorsal aspect of the 10 abdominal segment of the ♀ cockroach, showing location of the depressions in the cuticula. D, depressions; C, cerci.

Fig. 2. Appearance of depressions under oil immersion lens. P. pore.

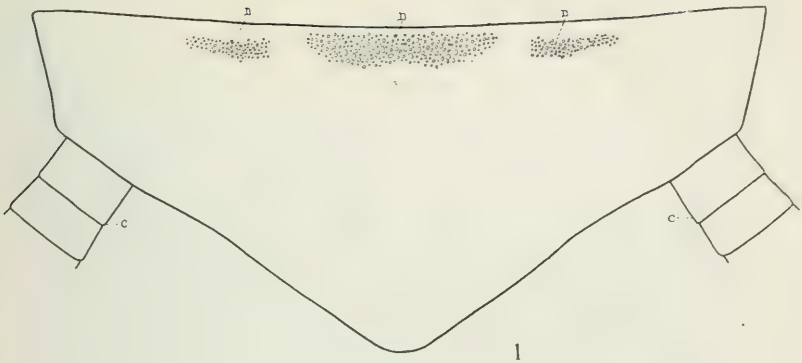
Fig. 3. Cross-section through a depression. Cu, cuticula; P, pore.

Fig. 4. Longitudinal section through the region of the pores. Cu, cuticula; Hyp., hypodermis; Gl., glands.

Fig. 5. Cross-section through the middle group of depressions. D., depression; N. Hyp., normal hypodermis; Gl., glands.

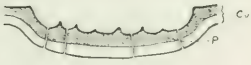
Fig. 6. Longitudinal section through the region of the pores (greatly enlarged). D., depression; Cu., cuticula; N. Hyp., normal hypodermis; Gl., glands.

Fig. 7. Glandular cell (greatly enlarged). Cu., cuticula; P., pore; C., canal; R., reservoir; B.M., basement membrane.




1

2

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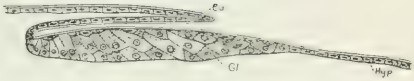


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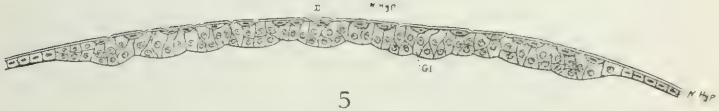


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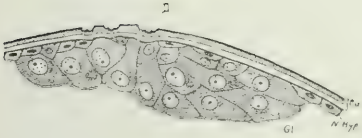


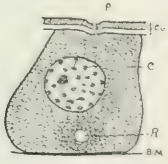


7

PYGIDIAL GLANDS OF BLATTELLA.

# AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA.

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

(Continued from page 252.)

182. *Ipochus fasciatus* LeConte.
Taken in Southern California; common under bark of dead willow and oak. Found by Van Dyke hibernating. May 29.

183. *Monilema semipunctatum* LeConte.
Found near Cape San Lucas, Lower California.

184. *Monilema spoliatum* Horn.
Found in San Bernardino County. Taken by Wright at San Borga, Lower California.

185. *Monilema subrugosum* Bland.
Found at San José del Cabo, Lower California.

186. *Monohammus titillator* Fabricius.
Found in the middle and northern Sierras. Taken at Donner Lake by the author, July 1–12.

187. *Monohammus maculosus* Hald.
Found in the middle Sierras. Taken from pupal chambers in bark of *Pinus ponderosa* by author. July 6. (Donner Lake).

188. *Monohammus scutellatus* Say.
Found in the Sierras. Taken by the author at Donner Lake. July 7.

189. *Ptychodes trilineatus* Linné.
Taken at San José del Cabo, Lower California.

190. *Synaphoeta guexi* LeConte.
Found in the middle Sierras and Middle California. Bred from limbs of buckeye by Rivers and myself. Bred from chestnut at Los Angeles by Van Dyke (eastern chestnut). It is collected about willows in Southern California. It also breeds in poplar. Taken by author at Calistoga, Donner Lake, and Oro Grande. May 13–July 10.

191. *Acanthoderes peninsularis* Horn.
Found at San José del Cabo, Lower California.

192. *Lagochirus obsoletus* Thomson.
Found at Cape San Lucas, Lower California.

193. *Cœnopœus palmeri* LeConte.
Taken by Wright in San Bernardino County. Breeds in *Cactus opuntia*.

194. *Cœnopœus niger* Horn.
Found at El Chinche, Lower California.

195. *Leptostylus nebulosus* Horn.
Found in Washington and Nevada, and, therefore, must be present in the Sierras.

196. *Leptostylus biustus* LeConte.
Found at San José del Cabo, Lower California.

197. *Liopus crassulus* LeConte.
Bred by Schwartz from dead twigs of *Celtis texana*. Taken at Cape San Lucas, Lower California.

198. *Dectes spinosus* Say.
Breds in stems of *Ambrosia*, especially ragweed (*artemisiæfolia*), in which the larvæ hibernate. Found in Sierra San Lazaro, Lower California.

199. *Mecotetartus antennatus* Bates.
Found at Sierra El Chinche and Cape San Lucas, Lower California.

200. *Hyperplatys californicus* Casey.
Bred by Schwartz from dry twigs of *Populus monilifera* and *tremuloides* June 3. This is the western phase of *H. aspersus* Say.

201. *Hyperplatys aspersus* Say.
Found in California. Bred from apple twigs by F. X. Smith.

202. *Acanthocinus obliquus* LeConte.
Taken by Van Dyke breeding in yellow pine. Found in the Sierras from Mt. Shasta, south of Mt. Whitney. June 18.

203. *Acanthocinus spectabilis* LeConte.
Feeds on several coniferous trees, also breeds in pine stumps and logs, particularly that of yellow pine. Taken by the author from pupal chambers in the bark of yellow pine at Donner Lake. Found in the Sierras from Mt. Shasta to the San Bernardino Mts. July 1–21.

204. *Estola sordida* LeConte.
Found at San José del Cabo, Lower California.

205. *Peritapnia nudicornis* Bates.
Found in Sierra El Chinche, Lower California.

206. *Lypsimena californica* Horn.
Found by Van Dyke at Santa Monica, by Fall rarely at Pasadena, and by Fuchs in Yuba County.

207. *Pogonocherus crinitus* LeConte.
Bred from oak at Pasadena by Dr. Fenyes; bred from oak in Marin and Alameda Counties by Van Dyke. Found in Middle and Southern California. June 2–August 20.

208. *Pogonocherus concolor* Schaeffer.
Beaten by Pilate from *Fremontidendron*. Taken by Schaeffer in the middle Sierras.

209. *Pogonocherus oregonus* LeConte.
Found in the middle Sierras. Taken by Nunenmacher in Eldorado County; taken by Fall at Tahoe; thought by Van Dyke to breed in fir, probably also Douglas spruce. May 10–August 9.

210. *Pogonocherus californicus* Schaeffer.
Found in the middle Sierras; taken by Van Dyke in Placer County; taken by Blaisdell in Calaveras County; taken by Schaeffer in Tulare County. June 6.

211. *Pogonocherus volitans* LeConte.
Found at Cape San Lucas, Lower California.

212. *Ataxia setulosa* Fall.
Found in Lower California.

213. *Saperda hornii* Joutel.
Taken at Los Angeles, Northern California, and the Sierras. Taken from willow by Van Dyke and Rivers.

214. *Saperda populnea* Linné.
Found in Northern California and as far south as Los Angeles. Feeds on poplar. Taken by author by beating poison oak bushes at Felton, Santa Cruz County. July 1-4.
var. *tulari* Felt & Joutel.
Taken in Merced and Tulare Counties.

215. *Mecas inornata* Say.
Breeds in the stems of the false sunflower and in *Helianthus tuberosus*.

216. *Oberea schaumii* LeConte.
Found in various parts of California, more common in the Sierras; breeds in willow and cottonwood, taken by Van Dyke in the Sierras, breeding in live twigs of the latter.

217. *Tetraopes elegans* Horn.
Taken at San José del Cabo, Lower California.

218. *Tetraopes femoratus* LeConte.
Taken in Sierras. May 11–June 17. Very common at times on milkweed.
var. *mancus* LeConte.
Common in Southern California on milkweed.
var. *basalis* LeConte.
Common throughout the Sierras on milkweed.
var. *oregonensis* LeConte.
Found in northern Sierras on milkweed.

219. *Lianema tenuicornis* Fall.
Found at El Taste, Lower California.

220. *Idæmea fulleri* Horn.
Reported from the southern part of the State. *I. californica* is, however, the one most probably seen in this State.

221. *Idæmea californica* Fall.
Beaten by Fall from live oak at Pasadena in June; others taken by Fall at light; several taken by Van Dyke on the sea shore at Santa Monica.

222. *Styloxus lucanus* LeConte.
Found in Lower California.

223. *Methia æstiva* Fall.
Found around electric lights at Pasadena.

224. *Dysphaga debilis* Horn.
Found at San José del Cabo, Lower California.

ADDITIONS TO LIST.

225. *Mallodon molarium* Bates.
Found at San José del Cabo, Lower California.

226. *Acyphoderes delicatus* Horn.
Found at El Taste, Lower California.

There are four species in the list which were given separate numbers which may be either synonyms or varieties (84–85, 131, 156, 199). Therefore, there are 178 unquestioned species confined to California, 10 present both in California and Lower California, and 43 confined to Lower California.

# THE PROBABLE ANCESTORS OF INSECTS AND MYRIOPODS.*

BY G. C. CRAMPTON, PH.D., AMHERST, MASS.

In view of the fact that such Crustacea as *Bathynella*, *Apseudes*, etc., so obviously fulfil the conditions one would naturally look for in those forms which are supposed to have departed as little as any from the ancestral condition of insects, it is indeed surprising that they have been passed over in silence (although they have been known to science for many years) despite all of the speculation concerning the nature of the ancestors of insects, and the various forms which have been put forward as the probable ancestral types. A comparative morphological study of the forms in question, however, has convinced me that they represent quite closely some of the types from which insects have sprung, and I would, therefore, maintain that the Anomostraca (e. g. *Anaspides*, *Koonunga*, *Bathynella*, etc.) and the Isopoda-Amphipoda group (e. g. *Apseudes*, *Ligia*, *Gammarus*, etc.) contain certain forms very like some of the ancestors of both insects and "myriopods" (*sensu lato*).

It should be clearly understood that neither the first insects, nor their immediate ancestors, were of any one single type; but from the very first, the ancestral insects differed greatly among themselves—although the degree of variation may not have been as great as that between the different representatives of present-day Apterygota. Some of the ancestral insects were doubtless quite like the Protura, while others may have borne a stronger resemblance to the campodeoid or other types of apterygotan insects; but the Protura have departed as little as any known insects from the primitive condition of the hexapodan group as a whole, although they have not retained certain primitive features preserved in other representatives of the apterygotan group.

The developmental tendencies which were to result in the production of a proturan type of insect with long slender body, composed of approximately twenty-one segments (allowing six for the head region, three for the thorax and twelve for the abdomen),

*Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

August, 1918

bearing three pairs of "stumpy" legs in the abdominal region with reduced terminal appendages, etc., etc., are "foreshadowed," so to speak, in the *Bathynella* type of Crustacea, in which the body is also long and slender, and appears to be composed of approximately twenty-one segments. In *Bathynella* also, there is a marked tendency toward the reduction (or shortening) of the terminal appendages, and the last five segments of the body have lost their limbs completely, while the hindmost legs exhibit a marked tendency to become shortened and reduced—a condition which, if carried a little further, would result in the production of a creature in many respects quite similar to a proturan insect.

On the other hand, the "Isopoda-Amphipoda" group of Crustacea (including the Tanaidacea) exhibit many developmental tendencies which find opportunity for expression in certain other Apterygota. Thus the multiarticulate terminal appendages of such forms as *Apseudes* are suggestive of the many-segmented, paired cerci of such Apterygota as *Lepisma*, *Machilis*, etc., and the nature of the limbs, head, mouth-parts, and other structures in the Isopod-Amphipod group, is strongly suggestive of the condition found in certain Apterygota, even in regard to the minuter details. If we admit the possibility of the ancestors of insects differing markedly among themselves (as there is every reason to suppose was the case) it is, therefore, quite probable that some of them resembled the anomostracan type of Crustacea, while others probably resembled the isopod or amphipod type of crustacean.

It is quite probable that the ancestral "myriopods" were similar in many respects to the members of the "Symphyla-Pauropoda" group, and it would be a comparatively simple matter to derive these types from crustacean forms allied to *Bathynella* or other Anomostraca. If we assume that both the apterygotan type of insect and the Symphylo-Pauropodan type of "myriopod" were derived from crustacean forms allied to those mentioned above, it is evident that the myriopodan type in question has followed a course of development very close to that of the lower apterygotan insects; and in certain respects these "Myriopoda" have departed less from the ancestral condition than the most

primitive representatives of the Apterygota have, so that a study of the "Myriopoda" in question is fully as important for a phylogenetic study of insectan evolution, as that of the above-mentioned Crustacea.

Any attempt to derive winged insects from forms unlike the apterygotan type of insect is wholly unwarranted, to my mind, since the lowest winged insects, such as the ephemerids, Plecoptera, etc., are anatomically strikingly similar to such Apterygota as the Lepismids, etc., which in turn are connected by intermediate forms with the lowest Apterygota such as the Protura: and no one who has carefully examined the Protura could doubt that in them we have the most primitive known representatives of the insectan group; so that the recent attempts to derive winged insects directly from a trilobite type of arthropod (without reference to the Apterygota) are extremely "far fetched," to say the least, and even the weight of Handlirsch's authority as a palæontologist is insufficient to convince a skeptical morphologist, when the evidence of anatomy is directly against Handlirsch's assumption—although many recent writers who have not taken the trouble to investigate the merits of the case, have unhesitatingly accepted Handlirsch's astonishing proposal that winged insects are to be derived directly from a trilobite type of arthropod without reference to the Apterygota, and regardless of the facts indicated by a comparative anatomical and embryological study of apterygotan and pterygotan insects.

Even if one were to grant, for the sake of argument, that the anatomically and embryologically far more primitive Apterygota are not so near the ancestral type of insect as the Pterygota are, we would not be justified in assuming that the Pterygota are to be derived from a trilobitan type of arthropod, since, as I hope to bring out in a more detailed discussion of the question, the Trilobita are more closely related to the Merostomata than to any other arthropods (save perhaps the Apodidæ), and serve to connect the Apodidæ with the Merostomata in a line of development leading *away from* that of insects and *toward* the *arachnid* line of evolution, instead of the trilobites standing more nearly in the direct line of descent of the insectan type of arthropod. Insects

may perhaps also be derived from arthropods similar to the Apodidæ, or the Branchiopoda, but their line of development leads through such forms as the Leptostraca (and their relatives), to the Cumacea, Tanaidacea, and Anomostraca; while the line of development of the arachnids leads from the Branchiopoda, or Apodidæ, through the trilobites to the Merostomata, Eurypterida, etc., as can be readily seen by comparing such fossil merostomes as *Bunodes lunula* and other antenna-bearing Merostomata, with the Trilobita.

I would, therefore, maintain the following points: 1. That the trilobites do not stand in the direct line of descent of insects, but rather in a side branch leading off from the Branchiopoda and Apodidæ to the Merostomata, Eurypterida, and other arachnoid forms. 2. That the line of development of insects leads from the branchiopod (and apodid) type of arthropod, through such forms as the Leptostraca and their relatives, to the Anomostraca, Tenaidacea, and other crustacean forms which have preserved many features characteristic of the ancestors of insects and "myriopods". 3. That the members of the Symphyla-Pauropoda group are in many respects quite similar to certain of the ancestors of the "myriopods" in general, and that the members of the Symphyla-Pauropoda group are likewise very similar to certain ancestral insects, whose line of development is quite closely paralleled by that of the "myriopods" in question. 4. That the Apterygota in general have departed the least from the ancestral condition of insects as a whole, and the Protura are as primitive as any known Apterygota. 5. That apterygotan forms such as the Lepismids, etc., are very like the ancestors of winged insects and are structurally very closely related to the ephemerids and Plecoptera, which, with the fossil Palæodictyoptera, are the most primitive representatives of the pterygotan group. The details of the discussion of the evolution of insects, together with the grouping of the orders into super-orders containing the forms which are anatomically the most closely related, will be taken up more at length in a later paper dealing with the latter phase of the subject.

Mailed August 24th, 1918.

The Canadian Entomologist.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### NOTES ON A CECROPIA CATERPILLAR.

BY MRS. ANNIE G. HEWITT WHITE, TORONTO.

On a lilac bush in my garden I was fortunate enough, in late September, to find a fine specimen of the large green caterpillar of the Cecropia Moth. Cutting the branchlet holding the handsome sojourner, I mounted it on a large potato, to keep the leaves fresh, and placed a battery jar over it.

About 10 o'clock on the night of the 23rd of September, the caterpillar began spinning its cocoon.

Sept. 25th.—Outer wall of cocoon finished and looks like a transparent, silk basket. The caterpillar still moving in that peculiar figure-of-eight, that I have observed seems to be the motion which all spinning caterpillars adopt.

Sept. 26th.—Cocoon almost opaque, shaped like an airship, 3¾ inches long, 1 7/8 inches wide. Caterpillar dimly seen within, still moving.

Sept. 28th.—Cocoon complete; all quiet within.

Oct. 8th.—Heard a scratching sound. Thought it was a mouse and instituted a search. Traced the sound, which seemed now more like silk being torn, to the corner where the cocoon was placed. It continued the whole evening.

Oct. 9th.—Scratching still continues, 8 o'clock, p.m. Can no longer resist the temptation to see what is going on, will wait a day.

Oct. 10th, 8 p.m.—Opened the cocoon, and saw one of the most wonderful of Nature's workings that has ever been vouchsafed to me.

Carefully cutting open the side of the cocoon, and turning down the flap made, I had a window-like opening by which to watch the proceedings. The caterpillar, still unchanged, stood on end within the smoothly-lined cocoon, his gaily coloured tubercles as bright as ever against the pale, green body.

Suddenly he rose and fell, as if heaving a deep sigh. Then he began a curious swaying movement, round and round, or from side to side, much like the movement of a bear.

At last, the skin at the back of his neck cracked open, and his motion became more violent. Extending himself to his greatest length he raised his first pair of legs, the others moving also, but not to such extent, as if praying for help. Then he drew down, down, till he seemed to crouch in despair.

Keenly excited now I gently opened the cocoon-window wider, and now the reason for the decorations of gaudy tubercles was explained.

As he moved in the various directions the spines rubbed against the wall of the cocoon, and thus aided him in discarding the larval skin. The crack in the skin had meanwhile greatly lengthened, and the head parts and leg cases slowly slid downward. It was very much like a child taking off a frock after the back is unbuttoned.

Now appeared to my enraptured gaze a totally new creature. A creature of soft, velvety folds of a golden yellow, with gelatine legs and heavy antennæ (it was evidently a male). The wings, as if folded many times, lay in thick clumps on the body, and the lower body wore the stripes of the perfect moth.

The swaying motion still kept on, the skin moving ever downward till neatly packed away, it formed the masque or cushion found in the empty cocoons.

Now from the segments of the body and seemingly from openings about the head, a yellow varnish began to exude, which gradually covered the whole creature; smoothing down the antennæ and legs, and levelling the wings with the body, till all the parts looked as if covered with yellow glass.

The change of form commenced at about nine o'clock in the evening. It was two o'clock in the morning when completed. The pupa still moved faintly, and was quickly turning a dark brown.

I sealed up the cocoon carefully, and put it away in a cold place to await further developments.

In June the moth came out in perfect order, none the worse for the evening's education it had afforded me.

# A NEW ISOTOMA OF THE SNOW FAUNA.

BY J. W. FOLSOM, URBANA, ILLINOIS.

This Canadian species of *Isotoma* is here described in order that its name may be used in a forthcoming article on insects of the snow by Mr. Charles Macnamara, after whom the new collembolan is named. He writes: "This species seems to be confined to wooded swamps; I have never seen it elsewhere; and it sometimes comes out on the snow in small numbers. This is the only pugnacious springtail I have ever observed. It almost always attacks an *Achorutes* put in the same vial with it and sometimes kills it."

**Isotoma macnamarai,** new species.

Olive green. Legs and furcula pale. Body segments bordered narrowly with black. Head conspicuously large in proportion to the body (fig. 1). Eyes (fig. 2) 8+8, on black patches. Postantennal organs absent. Antennæ four-fifths as long as the head, with segments in relative lengths as 8, 12, 13, 21; fourth segment elliptical. Sense organ of third antennal segment with two geniculate sense clubs (fig. 3). Fourth antennal segment with slender curving sense hairs. Unguis stout (fig. 4), with a proximal outer pair of small teeth and with a conspicuous inner tooth one-third from the base. Unguiculus more than half as long as unguis, broadly lanceolate, unidentate at the middle of the inner margin. Tenent hair single, unknobbed. Third and fourth abdominal segments subequal in length. Fifth and sixth abdominal segments not ankylosed. Furcula apparently appended to the fifth abdominal segment, gradually tapering and short, extending a little beyond the posterior margin of the second abdominal segment. Manubrium and dentes subequal in length. Dentes crenulate dorsally. Mucrones two-fifths as long as hind ungues, quadridentate (fig. 5); apical tooth short, not hooked; second and third teeth large, subequal; fourth small, lateral, at base of third. Rami of tenaculum quadridentate; corpus with ventral setæ. Clothing of abundant strong curving setæ of moderate length (fig. 6), with long, outstanding, simple sensory setæ, of which there are several pairs on the fourth and the fifth abdominal seg-

ments, and one pair on each of the remaining segments except the prothoracic, which has none. Maximum length, 1.8 mm.

This species is nearest *Isotoma grandiceps* Reuter, from Siberia and St. Lawrence Island, Alaska, but differs from the description of *grandiceps*, particularly in the form and markings of the head, the colour of the body, number of eyes, and number of mucronal teeth.

Arnprior, Ontario, Canada, December to April, inclusive; Charles Macnamara. Ten cotypes.

### Explanation of Plate VII.

*Isotoma macnamarai.*—Fig. 1. Dorsal aspect, from photomicrograph by Mr. Macnamara, X 35. Fig. 2. Eyes of left side, X 346. Fig. 3. Sense organ of third antennal segment of right side, X 1120. Fig. 4. Right hind foot, X 653. Fig. 5. Right aspect of right mucro, X 653. Fig. 6. Setæ, median dorsal line of third abdominal segment, X 346.

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## ENTOMOLOGICAL COLLECTIONS OF THE LATE W. H. HARRINGTON.

The Entomological Collections of the late Mr. W. H. Harrington have been acquired by the Entomological Branch of the Department of Agriculture, Ottawa, and will be incorporated in the Canadian National Collection of Insects. The collection is particularly rich in the parasitic families of the Hymenoptera in which Mr. Harrington was specially interested. It contains a number of types of Provancher's species, as indicated in Messrs. Gahan and Rohwer's account of the "Lectotypes of the Species of Hymenoptera (except Apoidea) described by Abbé Provancher," given in several issues of *The Canadian Entomologist* from volume 49, No. 9, p. 298 to volume 50, No. 6, p. 196; accordingly, any types described as being in the Harrington Collection will now be found in the National Collection at Ottawa.

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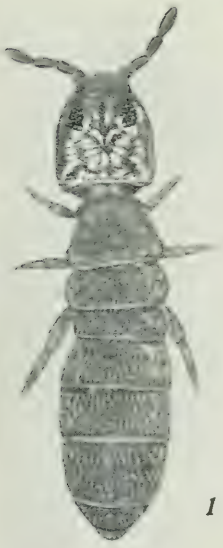

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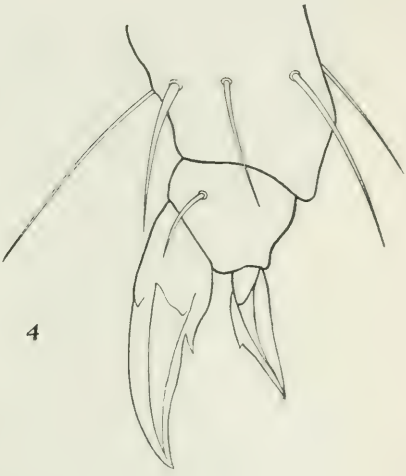

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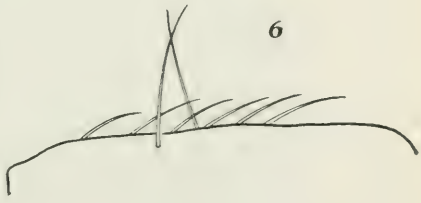

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J. W. FOLSOM

ISOTOMA MACNAMARAI, n. sp.

See p. 292.

## GEOMETRID NOTES—HYDRIOMENA.

BY L. W. SWETT, LEXINGTON, MASS.

The recent issue of Barnes and McDunnough's "Contributions to the Natural History of the Lepidoptera of North America," vol. IV, No. 1, contains an excellent "Revision of the Genus Hydriomena". It is a vast improvement on any former revision, as it is illustrated by excellent plates including figures of the genitalia. The work gives evidence of great pains and careful study and is based on large series of specimens, which unfortunately were lacking to the present writer in his original work on this genus. I would suggest that in order to supplement the revision the future student might work out the egg and pupal structure including the cremaster thorn and the life-histories, which would render it practically complete. In my early paper (Can. Ent., vol. 43, March, 1911) I attempted to straighten out the group on the basis of the palpal structure. I had little material and most of this was loaned, so that I could not study the genitalia, as stated in my article. From the date of my publication until two years ago I had received few additions in this group, and so had no chance to work out the life-histories. Barnes and McDunnough's paper with the figures of the specimens and the genitalia, is quite an advance over my early attempts. During the past year or two I had been in correspondence with Dr. McDunnough on the species of Hydriomena and their genitalia, with the result that except in one or two points we were practically of the same opinions. I have, therefore, very little to add to this valuable work except a few notes on the species. I believe that this classification, based on the genitalia and palpi, is on a sound basis and will be little changed.

Dr. McDunnough's separation of *H. furcata* Thunberg and *quinquefasciata* Packard is a painstaking piece of work. I could not separate these in my early paper as the material was all loaned, and it was only recently after I had made slides of the genitalia that I realized the differences between them.

In regard to *H. albifasciata* Pack. Dr. McDunnough is quite correct. I had only the female to judge by, and it was impossible to place the species correctly without the male. *Resecta* seems also to be a suffused, ruddy form of *albifasciata*, but it may later

prove that we are in error, and in that case the only species it could be referred to is *abacta*. Dr. Taylor and Mr. Grossbeck were the first to suggest the relationship between *albifasciata* Pack. and *reflata* Grote, as pointed out on page 78 of my paper. Dr. McDunnough, on p. 12 of his "Revision," associates *banavahrata* Strecker with *nubilofasciata* Pack., which is better than Dr. Dyar's reference to *californiata* Pack. A year or so ago I ran across a sketch of the type, made by Mr. Grossbeck, and this showed it to be *nubilofasciata* by the outer terminal bands on the primaries. If this sketch was made from the type, and I have every reason to believe it was, then *banavahrata* will fall under *nubilofasciata*. I shall restrict the type of *nubilofasciata* Pack. to the male in the Packard collection, as the female is badly rubbed and is possibly not the same species. The male type of *nubilofasciata* has a reddish shade to the central or mesial space.

In regard to *H. manzanita* Taylor I think this species, or a form of it, occurs in California, as Dr. McDunnough states, though sparingly. I have recently seen three or four rubbed specimens from there.

I have little to add to Dr. McDunnough's remarks (p. 17) on *H. frigidata* Walker and *transfigurata* Swett, except that I believe the labels, in some unaccountable way, were mixed on a specimen from New Brighton, Pa. I do not remember having seen *transfigurata* from Mr. Merrick, but I had several *frigidata* which I sent to Mr. Prout to be compared with Walker's type. Mr. Prout stated that they were the same as *frigidata*. It must have been one of these females, upon which I accidentally put a wrong label, as I knew both species at the time and would not have confused them. *Hydriomena transfigurata* is a rare species and is of a rather uniform, pale green colour. *H. niveifasciata* Swett seems to be correctly placed as a form of *irata*.

Dr. McDunnough's most startling discovery was concerning the types of *H. chiricahuata* Swett (p. 29); viz., that they were not conspecific. I distinctly remember that they were alike in markings, and the fact that he noted the same, goes to prove the value of genital characters in closely allied species. Future work on this group should be based on very large series from all localities, and on field notes.

I think I may have confused Dr. McDunnough on *bistriolata* Zeller, as I was mistaken in supposing the Cambridge specimen to be a paratype. I have made a careful study of Zeller's descriptions and Dr. Hagen's methods, and find that the error may be laid to Packard's door, where he states in the Monograph that he has Zeller's types. Unless Zeller states that the specimens are in the museum at Cambridge they cannot be considered as types, as his descriptions indicate. Hagen appears to have sent specimens to Zeller and placed a yellow label on the specimen agreeing with those he sent; hence they may be considered as having been merely compared with the type. This does not alter our conception of the species as both Dr. McDunnough and I knew it, but changes the fixation of types.

I have positively identified the type of *glaucata* Pack. as the specimen in the Henry Edwards' collection, so labeled. I find in the older plates of the Boston Society of Natural History the wings are reversed, so by a careful comparison of holes and tears in the wing I was able definitely to place it. Mr. Frank Watson has again checked my notes and made comparisons verifying my conclusions. In the original Henry Edwards' catalogue, for No. 1375, he gives "Santa Clara Co., California, taken at rest in forest, on a pine tree, in June." The specimen was originally mounted on a headless brass pin, but was repaired and remounted on May 2, 1917, and stands as No. 13197, Henry Edwards' collection.

*Hydriomena edenata* Swett has more elongated primaries than *glaucata* Pack. Apparently Dr. McDunnough has a closely related form, shown on pl. VI, fig. 4, but the basal and mesial lines do not exactly match the type of *glaucata*.

*H. regulata* looks superficially like a suffused form of some of the *speciosata* group.

*H. periclata* Swett should be placed as a form of *H. quinquefasciata* Pack., rather than *furcata*, the type having a broken uncus, and a recent second specimen showing the correct location of the form. I am to blame for this, rather than Dr. McDunnough, as in my notes to him on the species I so placed it incorrectly owing to this defect in the type and the lack of other material. The receipt of two males recently from the same locality enabled me to place it correctly.

I have still another new species of *Hydriomena*, which I

received from the Provincial Museum, Victoria, B.C., through Mr. E. H. Blackmore. It may be described as follows:

**Hydriomena macdunnoughi,** sp. nov.

This species has a very close resemblance to *H. ruberata* in colour and style of markings, and can be best compared with that species.

Palpi moderate, front of head dark ashen, thorax and abdomen fuscous. Fore wings dark ashen gray with a ruddy tinge. The basal band runs straight across the wing, except where it bends outwardly on the median vein and again sharply outwards at vein 1. The mesial band as a whole is smoky fuscous with a ruddy tinge and crossed through the middle by the usual watery band. The intradiscal, black band runs straight to median vein, then makes an incurve to inner margin. Mesial space quite narrow, pale ashen with a ruddy tinge, and containing a prominent, linear, discal dot. Extradiscal line running almost straight across the wing, irregularly scalloped inwardly on the veins. Marginal area ruddy grey with a smoky, curved band running through the centre. There are geminate black dots at the base of the fringe. Hind wings dark, smoky gray with a prominent black, curved band beyond the discal spot.

Fore wings beneath smoky with two outer curved bands beyond the discal spot. Hind wings of same colour with a prominent, black, curved extradiscal line, beyond which is a second faint line.

The fringe on all the wings is short and fuscous.

The palpi in this species are much shorter than in *ruberata*, and the general colour is a darker smoky fuscous with ruddy tinge. The course of the basal and median bands is different from that of *ruberata*. The uncus is broader near the tip, and the valvae do not narrow as in *ruberata*, but are broad and full one-third back from the tip.

Expanse 28 mm.

*Holotype.*—♂, Atlin, B.C., June 11, 1914, from E. H. Blackmore, in the writer's collection. *Allotype.*—♀, Atlin, B.C., June 11, 1914, in Mr. Blackmore's collection.

*Paratypes.*—3 ♂'s, Atlin, B.C., June 11, 1914, in coll. Blackmore, and 1 ♂ of above date in collection of the writer.

I have named this species after my friend, Dr. Jas McDunnough, in recognition of his excellent work on the genus *Hydriomena*.

# NEW SPECIES OF ODONATA FROM THE SOUTH-WESTERN UNITED STATES.

## Part II.

BY CLARENCE HAMILTON KENNEDY,
Cornell University, Ithaca, N. Y.

The following undescribed species have been in the writer's hands for some time awaiting that time when he had hoped to be able to write a more comprehensive paper covering this region.

I wish to thank Dr. P. P. Calvert for the privilege of decribing the Æschna from his collection, and Prof. S. J. Hunter for the privilege of describing the material from the Snow collection.

### Erpetogomphus lampropeltis, n. sp.

*Holotype.*—Male caught by the writer on Sespe Creek, Fillmore, Ventura Co., California, Aug. 7, 1915, and now in the U. S. National Museum.

*Paratype.*—Female *not* in copula with the holotype but with the same data, now in the U. S. National Museum.

Male.—Length of abdomen 30 mm.; appendages 2 mm. Length of hind wing 25 mm.

Colour.—Face pale gray, with a brown line along the labral suture and one on the fronto-nasal suture. Vertex brown; antennæ black ringed with yellow. Rear of head mottled with gray and brown. Eyes bluish gray above shading into gray below.

Thorax with the dark markings dark brown, the pale areas gray as follows: Dorsum brown with the middorsal and meso-stigmal keels gray. Antealar ridges brown. A narrow (2/3 mm. wide) antehumeral pale stripe sloping outwards from the antealar sinus. A second hair line of gray just anterior to the humeral suture, this line widened above to a triangular spot. Side of thorax gray with an irregular brown line on first lateral suture (½ mm. wide), and a similar brown line on second lateral suture. These are connected at about one-fourth their length from the alar ridge. Wings hyaline with black pterostigmata. Legs with coxæ and femora gray; the latter with a broad, dorsal brown stripe; tibiæ and tarsi black.

Abdomen with the pale markings on segs. 1–7 gray (almost white) and on segs. 8–10 an intense and vivid orange brown.

All dark markings intense black except on segs. 1 and 2, where they are brown. Seg. 1 brown with a large gray spot on its lower posterior angle. Seg. 2 brown with a middorsal pale stripe, the auricle and the lower posterior angle pale. Seg. 3 pale with its side nearly occupied by an anterior and a posterior black spot. Segs. 4–6 black with a pale band on the basal third. Seg. 7 similar but the pale band occupying the basal half. In life this band is very conspicuous because of the great amount of black before and after it. Segs. 8 and 9 with the dorsum black, the apical edge and the lower half of sides orange. Seg. 10 orange, browner at its base. Appendages yellow.

The appendages are like those of *crotalinus* and *designatus*. The tips of the dorsal pair are not as slender as in *designatus*, and the dorsal angle or hump is near the middle of the appendage. The inferior appendage is as in *designatus*.

Female.—Abdomen with appendages 36 mm. long; hind wing 30 mm.

Colour.—As in male but with the brown on segs. 1 and 2 reduced to an apical ring and a broad, lateral stripe. Segs. 3–7 each with a broad, middorsal, lanceolate, pale spot and a pale spot on the lower edge of the side. Segs. 8–10 as in the male.

The vulvar lamina is similar to that of *designatus* but the lateral lobes are broadly triangular, two-fifths as long as seg. 9, and terminate in acute points caudad.

The nearest relative seems to be *designatus*.

This is named after the handsome black-and-white banded king snake of California.

**Æschna arida,** n. sp.

*Holotype*.—Male, from Fort Wingate, New Mexico, and now in the collection of Dr. Calvert.

*Paratype*.—Female, from "Oak Creek Canyon, Arizona, 6,000 ft., Aug., F. H. Snow." This is one of a pair in the Snow collection of Kansas University, at Lawrence, Kansas.

The male of this pair in the Snow collection bears the same pin label as the paratype, and is referred to in the description as the "second male."

Male.—Colour; face greenish, labrum with a black line across its articulation; a narrow fronto-nasal line. T-mark conspicuous,

its stem triangular. Frontal vesicle edged with yellowish above. Occiput small and pale, rear of head black, eyes brown (dried material) with a conspicuous dash.

Thorax brown. Dorsal stripes 1 mm. broad; enlarged at the upper end. Lateral stripes yellowish, (probably greenish in life with yellow ends). Both are broad and straight; the anterior being slightly notched at the middle of its anterior edge and narrower from there to the upper end. Anterior stripe 1.5 mm. wide below, slightly narrower in its upper half; the posterior stripe nearly 2 mm. wide.

Each lateral stripe bordered on both edges of its entire length with a wide band of dark brown. Wings hyaline, stigmata 4 mm. long in type; 3 mm. in second male, dark brown above, yellowish below. Legs black with the bases of the femora dark brown.

Abdomen brown on segs. 1–3, black on 4–10 with blue markings. The figure shows the shape of these.

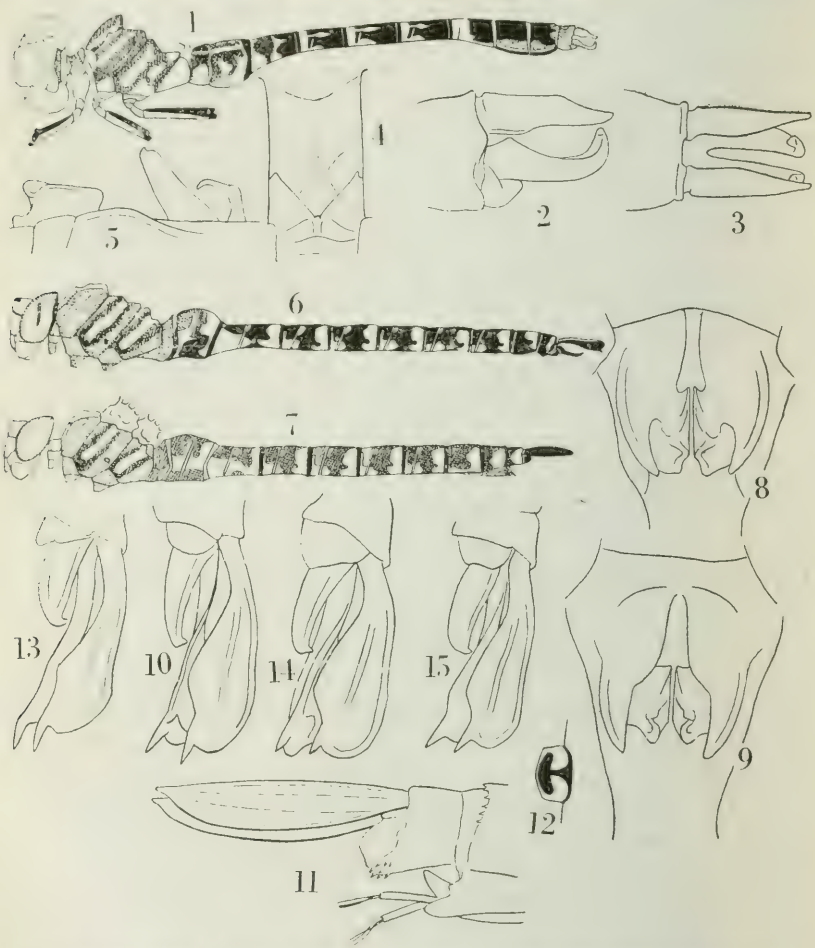
M D present on segs. 3–7, P D is very large and roughly triangular, fusing broadly below with P L. M L is present on segs. 3–8. A L present on segs. 2–8. A narrow, apical band on seg. 10. Ventral surface probably black.

Female.—Colour—as in the male but with the brown of the thorax paler. Veins of wings brown. Abdomen brown, becoming darker caudad.

This species is close to *constricta*, *palmata* and *walkeri*. See figs. 6–15. The male appendages are broad as in *walkeri*, but have the long terminal spines of *constricta*. The hamules show few characters different from those of the above species. In the type male these are thrown caudad with the extruded penis, hence the difference between the figs. 8 and 9. In colour the male differs from its relatives in the broad, lateral stripes and the wide, dark borders to these. From *walkeri* in the presence of M D. From *constricta* in the presence of P L on segs. 5–8. From *palmata* in the greater amount of blue on the abdomen. The female is easily distinguished by the appendages which are narrow, heavy and *nearly straight on the dorsal edge.*

The name refers to the desert region in which are the more humid mountains from which the types have come.

CAN. ENT. VOL. L. PLATE VIII




NEW ODONATA FROM THE SOUTHWESTERN UNITED STATES.

See p. 297.

Figs. 1—5. *Erpetogomphus lampropeltis.* 1. Male colour pattern. 2—3. Male appendages 4. Vulva. 5. Male second segment.

Figs. 6—12. *Æschna arida.* 6. Male colour pattern. 7. Female colour pattern. 8. Hamules of "second male". 9. Hamules of Holotype. 10. Appendages of male. 11. Appendages of Paratype. 13. *Æschna constricta.* 14. *Æschna walkeri.* 15. *Æschna palmata.*

# POLLINATION OF ALFALFA BY BEES OF THE GENUS *MEGACHILE*. TABLE OF CANADIAN SPECIES OF THE *LATIMANUS* GROUP.

BY F. W. L. SLADEN, APIARIST, DOMINION EXPERIMENTAL FARMS.

A study has been made of the species of bees that trip and therefore, presumably, pollinate the flowers of alfalfa in the parts of Canada where this plant is or can be grown for seed.

In July and August, 1916, the females of a species of leaf-cutter bee, *Megachile diligens*, Sladen* (*latimanus* Cockerell, not of Say) were found to be visiting the fields of alfalfa in bloom and tripping the flowers in considerable numbers at Medicine Hat and Lethbridge, Alta., each flower visited being tripped. The same thing was noticed in 1917, when they were observed to be tripping the flowers at an average rate of 17 per minute. This species was more numerous in the alfalfa fields than five other species of *Megachile* together, (*perihirta* Ckll., *calogaster*, Ckll., *vidu* Sm., *manifesta* Cr. and *brevis* Cr.) all of which performed the same service. Several species of bumble-bees, fairly plentiful, worked more slowly and often failed to trip the flowers. Honey-bees, also plentiful, visited the flowers without tripping them.

Observations made on July 20, 1917, at Summerland, B.C., and on July 21, at Keremeos, B.C., gave the same results, except that *perihirta* was the abundant species, *M. diligens* not having been met with in British Columbia.

*M. perihirta* was found nesting gregariously in a nearly new and bare gravel railway embankment at Cochrane, Ont., on August 9, 1917. A nest of the same species was found in a nearly new gravel road leading to a dwelling house at Invermere, B.C., in July, 1914. There is, therefore, some hope that *perihirta* might be encouraged to breed in the vicinity of alfalfa fields by spreading gravel and making it firm by rolling. *Diligens* might also be encouraged in this way because it is very closely related to *perihirta* and probably has similar nesting habits.

Closely related to these two species is a third, *latimanus* Say, found in Southeastern Canada. These three species constitute

*The name *diligens* was first used in the Agricultural Gazette of Canada, Feb. 1918, p. 125.

what may be called the *latimanus* group to which Robertson gave the name *Xanthosarus*.

The males of all three species were taken at the wild liquorice (*Glycyrrhiza lepidota*) at Lethbridge on June 28, 1914. The flowers of this plant wither about the middle of July, and *diligens* was found in abundance on *Psoralea argophylla* within the railway fence between Redcliff and Medicine Hat on July 31, 1917. As both these plants are *papilionaceous*, it is not surprising that alfalfa should prove attractive to these bees. The females of *diligens* show considerable hostility to a person trespassing in the alfalfa fields by zigzagging before him more frequently and more menacingly than bumble-bees do in a field of red clover, but they do not attempt to sting.

The females of the *latimanus* group are very active and energetic, far more so than honey-bees or bumble-bees. Their industry is equalled only by that of *Clisodon terminalis* (*Anthophora furcata* of Europe) which has not been observed at alfalfa except at Ottawa. *Perihirta* shows melanism in the north and on the Pacific Coast. No species answering to the description of the *latimanus* group is recorded in Friese's monograph of the European species of *Megachile* in "Die Bienen Europas," published in 1899.

As the species of the *latimanus* group are very closely related, and not easy to separate, especially in the females, the following table will be useful:

**Latimanus** Group. (**Xanthosarus** Rob.)

♂.—Fore tarsi dilated, middle femora swelled so that they are stouter than hind femora, *middle basitarsi with a large process or tooth on underside.*

♀.—Large, length 12 to 15 mm. pollen brush pale red, paler at base, white felt hair bands on the apical margins of abdominal segments 3 to 5; 6th dorsal segment well clothed with comparatively long hair which becomes shorter and decumbent towards and at the apex. This hair is white to pale golden but black in northern localities, *and there are always some pale, reddish hairs on the sides of the 6th segment.*

MALES.

1. *Process on middle basitarsi narrow and ridge-like.* Pile pale yellow-brown, becoming paler on exposure. Abdomen densely

clothed, the pale felt bands on the apices of segments 2 to 5 scarcely developed. Length 11 to 13 mm.....*perihirta* Ckll.

Haileybury, Ont.; Cochrane, Ont., (on *Epilobium angustifolium*), August 8, 1917; Lethbridge, Alta.; June 29, 1914; common at Summerland, B.C.; Keremeos, B. C., and Victoria, B.C., in July.

1. *Process on middle basitarsus nearly as wide as basitarsus*.....2

2. Pile bright yellow-brown, fading on exposure to pale yellow-brown, abdomen densely clothed, the pale, felt bands on the apices of segments 2 to 5 scarcely developed. Process on middle basitarsus rounded. Anterior tibiæ pale below. *No spine in front of the middle coxæ.* Length 12 to 14 mm.....*latimanus* Say.

Digby, N.S.; Ottawa, Ont.; Aweme, Man.; Melfort, Sask.; Lethbridge, Alta.

Pile very pale yellow-brown, fading on exposure to white. Segments 4, 5 and 6 sparsely clothed. Well-marked white felt bands on apical margin of segments 3, 4 ,5. Process on middle basitarsus with minute crest at apex. Fore tibiæ black on basal half above. *A spine in front of the middle coxæ.** Length 12 to 14 mm.....*diligens* Sladen (*latimanus* Ckll. not of Say).

Common at Medicine Hat, Alta., and Lethbridge, Alta., throughout July and August.

FEMALES.

1. Pile on thorax and base of abdomen greenish white, soon becoming white. Few or no black hairs on upper side of thorax (hairs on disc of thorax short and easily rubbed off). *White felt bands on apical margin of segments 3, 4 and 5 wider* (about .25 mm. wide in centre of segment 4). Hair on segment 6 entirely pale. Pollen brush pale red only on apical part.....*diligens* Sladen (*latimanus* Ckll. not of Say).

Common at Medicine Hat, Alta.; Redcliff, Alta., and Lethbridge, Alta., throughout July and August.

Pile on thorax and base of abdomen pale brownish yellow, be-

*This remarkable character was pointed out to me by Mr. J. C. Crawford.

coming paler on exposure. A patch of black hair on centre of upper surface of thorax. *White felt bands on apical margin* of segments 3, 4 and 5 *narrower* (about .15 mm. wide or less in centre of segment 4) and narrowed or interrupted in centre, at least on segments 3 and 4. Pollen brush more extensively red.....2.

2. Hair on segment 6 denser, never mixed with black. Apical felt band on segment 5 never interrupted in middle. Black patch on thorax never large. Red of pollen brush somewhat paler.....*latimanus* Say.

Fredericton, N.B.; Ste. Anne de la Pocatiere, Que.; Ottawa, Ont., common on sunflowers; Toronto, Ont.; Aweme, Man.; Lethbridge, Alta.; July and August.

Hair on segment 6 less dense, usually pale and almost entirely black in specimens from Northern Ontario and Northern Alberta; these specimens and specimens from Victoria, B.C., have the white felt bands, on apices of segment 3 and 4, and also sometimes on segment 5 very weak and widely interrupted in middle. Black patch on thorax larger (in specimens from Northern Ontario and Northern Alberta covering almost the entire upper surface). Red of pollen brush somewhat brighter.....*perihirta* Ckll.

Thornloe, Ont.; Cochrane, Ont.; Athabaska, Alta.; Lethbridge, Alta.; Invermere, B.C.; Penticton, B.C., Keremeos, B.C. and Victoria, B.C. Specimens from the interior valleys of Southern British Columbia are almost indistinguishable from those of *latimanus* Say.

Next in importance to the species of the *latimanus* group in the pollination of alfalfa is *Megachile calogaster* Ckll., a variety of, or closely related to *M. melanophæa* Sm. *M. calogaster* has no white felt bands at the apices of any of the abdominal segments, and segments 3 to 5 are black haired. The female has a bright red pollen brush, and the fore tarsi of the males are dilated and pale as in the *latimanus* group. It is common in Southern Alberta and Southern British Columbia, flying from about the middle of June until about the end of July, that is two or three weeks earlier than those of the *latimanus* group. It is found on many flowers besides alfalfa.

# NEW SPECIES OF RHODITES FROM OREGON.

BY WILLIAM BEUTENMULLER, NEW YORK.

## Rhodites oregonensis, sp. nov.

*Female.*—Head black, coarsely rugoso-punctate and finely pubescent. Antennæ 14-jointed, black. Thorax jet black, shining, minutely rugose with larger punctures, pubescent. Parapsidal grooves continuous, very distinct, and moderately widely apart at the scutellum. Median groove distinct, gradually becoming finer forwardly, especially between the anterior parallel lines, and practically lost at the collar. Anterior parallel lines fine and close to the median groove. Lateral groove very fine and scarcely defined. Pleuræ finely rugose with a large, smooth, polished area. Scutellum subopaque, black, finely and evenly rugose basal fovea wanting. Abdomen rufous, terminal segment blackish, microscopically punctate on the dorsal half of the last four segments, lower half and basal segments smooth. The punctured segments are clothed with yellowish decumbent hairs at their bases laterally, ventral sheath black, plough-shaped and extending beyond the last segment. Dorsum and venter rather sharply keeled with the sides moderately rounded. Legs rufous, tarsi dark brown-black. Wings yellowish, hyaline, veins dark brown and stout, transverse veins, slightly infuscated. Radial area closed, cubitus not continuous. Areolet large. Length 4.50 mm.

*Gall.*—(Plate, IX, Figs. 1–6). On the tip of the twigs or in the seed-pods of *Rosa nutkana*. Monothalamous. Red, smooth, elongate or subspindle-shaped with the apex rather sharply pointed and broader at the base, sometimes with the apex more or less rounded. It is an elongated malformation of a bud. Larval chamber large and situated at the base of the gall. (Figs. 1–4). When in the seed-pod the gall is somewhat like the kernel of a wheat or oat, and is densely covered with short, hairy filaments. The entire seed-pod, as a general rule, is completely filled with galls, closely packed together, sometimes causing the pod to burst open when the galls therein reach maturity. (Figs. 5–6.)

*Habitat.*—Corvallis, Oregon, (B. G. Thompson).

It is a very distinct species allied to *Rhodites rosæ*, *nodulosus* and *verna*. There are no differences between the flies I bred from

the twig galls from those in the seed-pods. The galls were sent to me in February, 1917, and the flies began to emerge indoors from February 28th until late in March. I also received galls in July collected by Mr. Thompson, who deserves credit for discovering this interesting new species as well as the three following species.

**Rhodites ashmeadi,** sp. nov.

*Female.*—Head black, finely and evenly granulate. Antennæ black, 14-jointed. Thorax black, very slightly shining, minutely granulate, with larger punctures. Parapsidal grooves fine and sharply defined, running almost parallel from the collar to the scutellum where they suddenly curved inwardly but are rather widely apart at this point. Median groove fine, and running from the scutellum to about the ends of the anterior parallel lines and are obliterated anteriorly. Anterior parallel lines very fine and scarcely evident, and widely separated. Lateral grooves exceedingly fine. Scutellum opaque, very finely and evenly rugose, granulated not more so than the thorax, basal fovea wanting. Pleuræ black, finely granulated with a smooth, polished area. Abdomen rufous, terminal segments and dorsum darker, terminal segments, punctate, and with short, yellowish, decumbent hairs, and more sharply keeled than the basal segments. Ventral spine not extending beyond the last segment. Wings dusky hyaline, radial cell yellowish brown and a small cloud beyond. Radial area closed. Cubitus continuous. Areolet distinct. Length 3–3.50 mm.

*Gall.*—(Plate IX, Figs. 7–10). On the stems of *Rosa nutkana.* Polythalamous. A hard, fusiform swelling of the twig varying from 12–30 mm. in length, and from 4–7 mm. in width. It is hard and woody like the stem and has numerous cells inside. (Fig. 7.) Externally it is red and smooth like the stem.

*Habitat.*—Corvallis, Oregon. (B. G. Thompson).

The galls were received from Mr. B. G. Thompson early in February, 1917, and the flies emerged from the latter part of this month until April 7th, 1917. Named in honor of the late Dr. W. H. Ashmead, who helped me so much in my studies of the Cynipidæ.

**Rhodites ostensackeni,** sp. nov.

*Female.*—Head black, roughly and evenly rugose. Antennæ 14-jointed, 3rd joint very long, following joints considerably shorter and subequal. Thorax black, highly polished, sparsely punctate but densely so between the parapsidal grooves at the scutellum, and with scattered, minute, yellowish hairs. Parapsidal grooves very distinct, deep and finely punctate. Median groove fine and continuous. Anterior parallel lines indistinctly evident. Lateral grooves short and distinct. Pleuræ finely rugoso-punctate without a smooth, shining area. Scutellum opaque, finely rugose, basal fovea wanting. Abdomen black or piceous, subglobose, microscopically punctate from the fourth to last segments, basal segments smooth. Ventral spine stout, extending slightly beyond the last segment. Legs rufous. Wing hyaline, clouded with yellowish brown in the radial cell and a little beyond. Veins dark brown. Radial area open at the costa. Cubitus continuous. Areolet large. Length 3–3.75 mm.

*Gall.*—(Plate IX, Figs. 11, 12). On the roots of *Rosa nutkana.* Polythalamous. Irregularly rounded and composed of confluent nodules, and is more or less irregularly grooved. At the place of attachment it is on a short stalk, and the gall may be easily removed. Inside are numerous hard larval cells firmly imbedded in the pithy substance. It looks very much like a miniature gall of *Rhodites radicum.* Width 12–17 mm. Height 10–15 mm.

*Habitat.*—Corvallis, Oregon. (B. G. Thompson).

A distinct species allied to *Rhodites utahensis* and *R. radicum.* The galls were sent to me by Mr. Thompson early in February, and the flies began to emerge about March 30th and early in April. Named in honour of the late R. von Ostensacken, the pioneer on the work of American Cynipidæ.

**Rhodites bassetti,** sp. nov.

*Female.*—Head black, densely punctate on the face, less so on the vertex and cheeks. Antennæ black, 14-jointed. Thorax black, very densely and finely punctate, subopaque. Parapsidal grooves rather sharply defined, continuous and widely apart at the scutellum. Median groove delicate and scarcely defined

anteriorly. Anterior parallel lines very delicate. Lateral grooves fine. Pleuræ black, subopaque, rugosely punctate with a shining, smooth or almost smooth area. Scutellum black, rugose and without basal fovea. Abdomen black, smooth, shining, with the ventral sheath extending slightly beyond the tip of the abdomen. Legs rufous. Wings dusky hyaline with the cubital and radial cells yellowish brown and a slight cloud of this colour in the large terminal area. Veins brown. Radial area closed on the costa. Cubitus distinctly continuous. Areolet distinct. Length 2.50–3 mm.

*Male.*—Colour of the female. Antennæ 15-jointed. Wings somewhat less infuscated in the cells. Length 2–2.75 mm.

*Gall.*—(Plate IX, Figs. 13, 14). On the tips of the twigs of *Rosa nutkana*. Polythalamous. A rounded, hard and woody gall densely covered with long, green filaments forming a moss-like mass as in *Rhodites rosæ*, and strongly concave at the place of attachment. Diameter 17–38 mm.

*Habitat.*—Corvallis, Oregon. (B. G. Thompson).

A number of galls of this species were sent to me by Mr. B. G. Thompson, collected December 10th, 1916. At first I considered them to be *Rhodites rosæ* Linn. But when the flies began to emerge (indoors) during the latter part of February until about the middle of March, I found that they were different from *R. rosæ* in sculpture and colour. The gall, although similar externally to *R. rosæ*, differs by being more woody inside and strongly concave at the place of attachment, being almost like an inverted cup or bowl in shape, while the gall of *R. rosæ* is composed of an agglomeration of hard cells around a branch. Named after the late Homer F. Bassett.

## Explanation of Plate IX.

Figs. 1– 4 *Rhodites oregonensis* Beutm., on tips of branches.
Figs. 5– 6 " " in seed-pods.
Figs. 7–10 " *ashmeadi* Beutm.
Figs. 11–12 " *ostensackeni* Beutm.
Figs. 13–14 " *bassetti* Beutm.

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GALLS OF NEW SPECIES OF RHODITES.

See p. 308.

## A NEW NORTH AMERICAN SPECIES OF ANTHOMYIIDÆ (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

Among some Diptera recently received from Mr. C. W. Johnson I have found several very interesting forms, some of which are evidently undescribed. One of the most striking forms is the one described herewith, which is also represented in material in my hands belonging to the U. S. Bureau of Biological Survey.

**Hylemyia pluvialis,** n. sp.

*Male.*—Black, covered with dense gray pruinescence. Antennæ and palpi black; orbits and face with silvery pruinescence. Thorax not vittate. Abdomen with an interrupted dorso-central black stripe, which is slightly dilated at anterior margin of each segment. Legs black, tibiæ entirely or in large part rufous. Wings clear.

Eyes separated by less than distance across posterior ocelli; arista with the longest hairs about twice as long as basal diameter of arista. Prealar bristle usually absent; 3 strong pairs of presutural acrostichals usually present; pleura with normal hairs and bristles. Third dorsal abdominal segments with a truncate extension at posterior lateral angle; fifth sternite with broad processes which extend almost to apex of abdomen and are armed along outer margin with a fringe of long, slender bristles which are directed downward and curve mesad at their apices.

Fore tibia with one posterior bristle above middle; third and fourth fore tarsal joints slightly dilated; mid tibia with 1–2 antero-dorsal and 2–3 postero-dorsal bristles; hind femur with 5–6 widely spaced antero-ventral bristles, and 4–5 weak postero-ventral setulose hairs on basal half; hind tibia with 3–5 antero-dorsal and 3 postero-dorsal bristles, and 5–6 antero-ventral, and 7–9 postero-ventral setulose hairs. Third and fourth wing-veins slightly convergent apically; costal thorn of moderate length.

Length 5 mm.

Type locality, Gold Rock, Ont., Rainy River District, July 21 (H. H. Newcomb).

Paratypes.—Estes Park, Moraine Park, altitude 7,500 feet, Col. (E. C. Jackson.)

Type in collection of Illinois Natural History Survey, paratypes in collection of U. S. Bureau of Biological Survey.

## TWO NEW HYDROTÆAS. (DIPTERA, ANTHOMYIDÆ).

BY J. M. ALDRICH,
Bureau of Entomology, U. S. Dept. of Agriculture

The two species herein described possess the common characters of the genus,—sixth vein not reaching the margin of the wing, scutellum bare below, hind calypter projecting beyond the front one, four posterior dorsocentrals, and in the male two teeth on the underside of the front femur near tip. Males of the genus are quite easily separated by the armature of the legs, but these characters are greatly reduced or mostly absent in females, which are in several instances very difficult to distinguish. Mr. Malloch has tabulated the males for the known North American species in Bulletin of the Brooklyn Entomological Society, XI, 108, 1916, and the females in the same journal, XIII, 30, 1918. With the two herein described we have a total of 17 species, of which 9 are European.

The function of the femoral teeth which occur regularly in the males has not been observed to my knowledge. I surmise that the male grasps the front edge of the wing of the female with the femur and tibia during copulation; while this is merely a theory, it is offered as a stimulus to observation.

### Hydrotæa orbitalis, n. sp.

*Male.*—General colour deep black, only the abdomen noticeably pollinose. Eyes bare, separated on the front by about two-thirds of the space between the hind ocelli, the black median stripe distinct to ocelli, orbits very narrow, widening close to the antennæ, shining black to the level of the arista, below this like the flat facialia they are thinly brown pollinose; lunule white pollinose; antennæ black, of ordinary size, arista bare; palpi and proboscis black. Thorax subshining black above, more opaque black anteriorly, with no stripes; pleuræ wholly shining except a space above hind coxæ, which with the postnotum is thinly brown pollinose. Prealar wanting; two or three pairs of anterior acrostichals in rows close together, a few very delicate hairs barely visible

between them; halteres with black knob; calypters yellow. Abdomen ovate, above with somewhat changeable pollen with a rather bluish cast, showing an indistinct median black stripe. Legs black, front femora with the usual two teeth below near tip, the outer bearing four small spines on its outer side, with which several longer bristles near the base form a widely interrupted row; front tibia without bristles except at apex; middle femur with long, soft hairs on front and hind sides, a few more bristle-like in front on basal half, middle tibia with no bristles on outer front side in one specimen, in the other with one very small, and in both with two behind; hind femur on outer side with complete upper and lower rows of bristles, both nearly horizontal, and numerous hairs below on inner side, some of which beyond middle are bristly; hind tibia with one long bristle behind below middle, a complete row of cilia on outer hind side including one bristle below the middle, a row of cilia on apical half of outer front side, and on inner front side for the middle third a loose row of erect, slender hairs of which the uppermost are one-half longer than the thickness of the tibia; at the tip of the hind tibia on the inner side is a row of a dozen close-set little spines forming a small comb, which stands in a diagonal position. Tarsi of ordinary form, the pulvilli not much elongated. Wing brownish, narrow, third and fourth veins a little convergent, last section of fourth more than twice the preceding.

Length 6 mm.

Female unknown.

Two males: the type is from Lafayette, Ind., June 20, 1916; paratype Moscow, Idaho, June 19, 1910, taken on parsnip flowers. Both collected by the writer. The type will be deposited in the National Museum.

In Malloch's table the species runs to couplet 10, and of the remaining species is nearest related to *bispinosa* Zett., which, however, has a strong bristle on outer front side of middle tibia, and lacks the peculiar hairs on the inner front side of the hind tibia.

**Hydrotæa comata,** n. sp.

*Male.*—Deep black, subshining, abdomen only faintly pollinose. Eyes bare, separated at middle of front by about the dis-

tance between hind ocelli; frontal stripe extending to ocelli; orbits very narrow, widening below, shining black to below level of arista, then thinly brown pollinose; facialia and lunule more densely brown pollinose; antennæ black, of ordinary size, arista bare, its penultimate joint longer than wide; palpi and proboscis black; postorbital cilia long, slender, curling over the eye. Thorax shining black, unstriped, only the postnotum and a space above the hind coxa with thin, brown pollen; prealar indistinguishable among some long hairs, several pairs of long, erect anterior acrostichals mixed with slender, tall hairs; mesopleura and sternopleura with abundant long hair, the two stpl. bristles of striking length; halteres blackish, calypters deep yellow. Abdomen rather elongate, shining black, only when viewed from behind showing a thin, dark pollen with a median dark stripe. Legs wholly shining black; front femora with the usual two teeth below, and abundant hairs on outer side, among which below about five bristles form a short row; front tibiæ broadly flattened and corrugated on the inner side opposite the femoral teeth, without bristles except at tip; middle femora on front side with short, erect, dense hairs, on hind side with immensely long hairs, some 2/5 as long as the femur; middle tibia on outer front side with four slender bristles beyond middle, the subapical long and hairlike; on the outer hind side with four bristles, and on inner hind side close to tip with half a dozen smallish, hairlike bristles; middle basitarsus with unusually long hairs below, which are longer apically and continue but slightly reduced to the tip of the following joint; hind femur below at base with a stout, erect double spine with crooked tip; on the outer side the upper series of bristles is complete and the lower begins at the middle; hind tibia with striking rows of long villous hairs or bristles on the outer and inner flexor sides, the outer especially long, some of them 2.5 as long as the tibia; a distinct bristle just below the middle behind, and on the outer hind side a series of long hairs in which two bristles occur. Pulvilli dark, not elongated.

Wings brownish, third and fourth veins barely convergent; last segment of the fourth less than twice the preceding.

*Female*.—Shining black, including abdomen. Front one-third the head-width, velvet black except the large, shining ocellar

triangle, which stops just short of the cruciate bristles, and the shining orbits, which become very wide near the antennæ, where together they exceed the stripe; thorax with the hairs not unusually developed; two pairs of large, anterior acrostichals with hairs between and before; prealar distinct, more than one-third as long as following bristle; two sternopleurals behind, the lower smaller, and one in front. Front tibia with one or two very minute bristles in front; middle tibia with three on outer front beyond middle, four on outer hind; hind tibia with one long behind, three on outer hind, three on outer front; middle tarsi normal; middle femur with a row of short bristles on front side, ending abruptly at middle, no unusual hairs behind. Calypters as in male, halteres more brown than black.

Length of male 7.2 mm.; of female 6.4 mm.

One male, one female, collected at Tacoma, Wash., on June 27, 1917, by Professor A. L. Melander, to whom they are returned.

The male runs to *occulta* in Malloch's table, from which it differs in many charaters, among them the presence of dense hair below on the first two joints of the middle tarsus. The female hardly runs at all in Malloch's table, as the halteres are intermediate between yellow and black, the first alternative; it separates from all other species in large size, wide shining, black orbits, and the armature of the middle tibiæ.

## OBITUARY.

### Lieut. Vernon King.

We regret to record the death of Lieut. Vernon King of the Royal Flying Corps, who was killed in France on April 11th, 1918.

Lieut. King was a graduate of the Ontario Agricultural College, Guelph, and before enlisting was a Scientific Assistant in the Branch of Cereal and Forage Insect Investigations of the Bureau of Entomology, U. S. Dept. of Agriculture. He resigned his position in November, 1914, and proceeded to England. After serving at the Dardanelles he joined the Flying Corps and was killed in an air fight while carrying on duties as an observer on the date mentioned. He was an extremely promising young man, and was very well liked by all who knew him.

# PARTIAL KEY TO THE GENUS AGROMYZA (DIPTERA), FOURTH PAPER.

BY J. R. MALLOCH, URBANA, ILL.

The key presented in this paper contains species with the following characters:

Frons partly reddish or yellow, either the interfrontalia or orbits or both entirely or in part pale; scutellum not noticeably paler than dorsum of thorax; costa extending to apex of fourth vein; halteres whitish or yellowish.

I believe that the species I described as *coloradensis* in October, 1913, is the same as that described by Melander, a week or two before the appearance of my paper, under the name *genualis*. The descriptions agree so clearly that I have indicated the synonymy in the present paper.

I have included *aceris* Greene in this key although I cannot tell definitely from the description whether the frons is partly red in front or not. The species is closely related to *pruinosa* with which it is compared in the key. There are several species closely related to these two, including *pruni* Grossenbacher, and *waltoni* Malloch, the arbitrary characters used in the keys being responsible for their occurrence in different papers in this series. All of the cambium-mining species I have examined have the orbits poorly or not at all differentiated from the interfrontalia, the thorax with very dense pruinescence, and 4 pairs of dorso-central bristles.

1. Mesonotum opaque gray; centre of disc between the rows of dorsocentrals with a yellowish brown longitudinal vitta which extends on to the disc of scutellum; 4 pairs of dorsocentrals present. Food-plant unknown. N. H.; Mo.; Ill.; N. M.; B. C. ..... *immaculata* Coquillett.
   Mesonotum shining, or if opaque gray then without a
   Mesonotum shining, or if opaque gray then without a brown longitudinal vitta ..... 2
2. Antennæ entirely yellow or reddish, the third joint occasionally slightly darkened at insertion of the arista ..... 3
   At least the third antenal joint black ..... 10
3. Pleuræ most yellow ..... 4
   Pleuræ black, at most the sutures yellowish ..... 6

4. Lateral margins of mesonotum concolorous with disc; pleuræ entirely yellow. Food-plant unknown. Ill.....*pleuralis* Malloch.
Lateral margins of mesonotum yellow; pleuræ with dark marks.....5

5. Very small species, 1 mm. in length; frons subquadrate; mesonotum with 3 pairs of dorso-centrals. Food-plant unknown. Wash.....*clara* Melander.
Larger species, 1.5 mm. in length; frons longer than broad; mesonotum with 4 pairs of dorso-centrals. Food-plant unknown. Cal.; Maine.....*citreifrons* Malloch.

6. Lateral margins of mesonotum pale yellow.....7
Lateral margins of mesonotum concolorous with disc.....8

7. Last section of fifth vein subequal to preceding section. Food-plant unknown. Alaska.....*pollinosa* Melander.
Last section of fifth vein twice as long as preceding section. Food-plant unknown. N. M.....*indecisa* Malloch.

8. Legs entirely black; frons reddish in front, blackish behind; thorax densely gray pruinescent, with 4 pairs of dorso-centrals; outer cross-vein at its own length from inner. Larvæ mining in cambium of *Amelanchier canadensis*. W. Va.....*amelanchieris* Greene.
Legs with the knees at least pale, either reddish or yellow....8a.

8a. Large, robust species, at least 4 mm. in length; orbits poorly or not at all differentiated from interfrontalia; thorax with 4 pairs of dorso-central bristles.....8b.
Smaller, slender species, at most 3 mm. in length; orbits well differentiated from interfrontalia; thorax with 2, rarely 3, pairs of dorso-central bristles.....9

8b. Palpi reddish yellow; first costal division not over two-thirds as long as second; last section of fifth vein subequal to penultimate section. Larvæ mining in cambium of *Betula niger*. Col., Va., Ill.....*pruinosa* Coquillett.
Palpi black; first costal division about three-fourths as long as second; last section of fifth vein distinctly longer than penultimate section. Larvæ mining in cambium of *Acer rubrum*. Va.....*aceris* Greene.

9. Last section of fifth vein 1 1/3 times as long as preceding sec-

tion first costal division (that beyond humeral vein) over half as long as second; interfrontalia entirely reddish; orbital and dorso-central bristles weak; proboscis and palpi fuscous; food-plant unknown. Ill. ..... *albidohalterata* Malloch.

Last section of fifth vein subequal to preceding section; first costal division half as long as second; interfrontalia infuscated on upper half; orbital and dorso-central bristles strong; proboscis and palpi orange-coloured. Food-plant unknown. D. C., Pa., Ill. ..... *varifrons* Coquillett.

10. Lateral margins of mesonotum broadly pale yellow ..... 11

Lateral margins of mesonotum narrowly, or not at all, yellow, the pale colour confined almost entirely to the suture or to the extreme upper margin of the pleuræ ..... 12.

11. Frons with the centre stripe pale yellow; orbits sometimes blackened posteriorly; legs black, knees never yellow. Larvæ mining leaves of *Malva, Verbena, Solidago, Helianthus, etc.* General ..... *jucunda* V. d. Wulp.

Frons with centre stripe more or less blackened; legs with knees pale yellow. Larvæ mining leaves of oats, wheat and other cereals. General ..... *coquilletti* Malloch.

12. Palpi yellow. Food-plant unknown.

General ..... *longipennis* Loew.

Palpi black ..... 13.

13. Lengs entirely black ..... 13.

Legs in part yellow ..... 15.

14. Shining black species, very slightly dusted; interfrontalia yellow; thoracic bristles very long; 4 pairs of strong dorso-centrals; last section of fourth vein three times as long as preceding section. Food-plant unknown.

Mont ..... *rutiliceps* Melander.

Opaque black, pollinose species; thoracic bristles distinct from setulæ; abdomen entirely black; frons reddish anteriorly, black posteriorly. Larvæ mining in cambium of *Amelanchier canadensis.* W. Va. ..... *amelanchieris* Greene.

Opaque black, pollinose species; interfrontalia yellow; thoracic setulæ long, dorso-centrals scarcely distinguishable from them except the posterior pair; last section of fourth vein

4 times as long as preceding section. Food-plant unknown. Id.....*auriceps* Melander.

15. Small species, 1.5 2 mm. in length; general colour shining black, interfrontalia black; orbits lemon yellow on upper half; apical half of femora yellow; tibiæ brownish yellow. Food-plant unknown. Mass., D. C., Ind., Ill.....*marginata* Loew.

Larger species, 2.5–3.5 mm. in length; general colour opaque black, gray pollinose; interfrontalia and orbits largely or entirely yellow; femora narrowly yellow at apices. Food-plant unknown. Mont., Id., Wash., Col., Maine.....(*coloradensis* Malloch) *genualis* Melander.

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## OUR BIRCH *SYMYDOBIUS* DISTINCT FROM THE EUROPEAN. (APHIDIDÆ—HOM.)

BY A. C. BAKER, WASHINGTON, D.C.

In 1909 specimens of the oviparous female of a species of *Symydobius* were collected from birch by the writer at Puslinch Lake near Guelph, Ont. These were determined as *oblongus* Heyden. Dr. Edith M. Patch* found the same species in Maine in 1908 and gave an excellent description and figures of it under the name *oblongus*. Specimens collected in 1903 on *Betula alba* in Minneapolis, Minn., presumably by Mr. Theo. Pergande, are now in the collection of the Bureau of Entomology. A study of the different specimens available has led the writer to conclude that our American form is quite a distinct species.

Specimens of *S. oblongus* taken in Petrograd by Chlodkovsky, in Warsaw by Mordwilko, and in Brussels by Schouteden, all agree in characters, and these are uniformly different from our American species.

In the alate form the most striking difference is met with in the relative lengths of the antennal segments. This will be seen from the following measurements of *oblongus* as compared with the description of the American species given herewith.

*S. oblongus* III, 1.12 mm.; IV, 0.72 mm.; V, 0.528 mm.; VI, (0.208 mm.+0.112 mm.).

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*Me. Agr. Exp. Sta., Bull. 181.

It will be seen by these measurements that the unguis of segment VI is much shorter than the base and only about one-tenth as long as segment III. In the American species on the other hand the base and the unguis of segment VI are almost equal, and the unguis is about one-fourth as long as segment III. In the American species also the anal plate is somewhat indented, whereas in the European species this is not noticed.

The apterous forms show the same differences between the two species in regard to segment VI of the antennæ, the European species measuring III, 1.168 mm.; IV, 0.72 mm.; V, 0.512 mm.; VI, (0.144 mm.+0.112 mm.). Another difference between the two species in this form is that in the American species segment III is armed with a row of sensoria which cover the entire segment, whereas in *oblongus* only the basal half of the segment is covered. There is this same difference also in the alate forms, but a little more than half of segment III is covered in *oblongus*.

**Symydobius americanus,** n. sp.

*Alate viviparous female.*—Antennal segments as follows: III, 0.96 mm.; IV, 0.64 mm.; V, 0.528 mm.; VI, (0.224 mm.+0.24 mm.). Segment III with a row of about 25 rather small protruding sensoria arranged in a more or less even row over the entire segment. Hind tibiæ 1.28 mm., hind tarsus 0.192 mm.; hind wing about 3 mm. long, cauda rounded, anal plate slightly notched.

Colour brown, abdomen with dark transverse bands, cornicles pale, wing veins heavily bordered with dark brown; antennæ with segments I to III and the distal extremities of IV, V and VI dark brown, the remainder yellowish white.

*Apterous viviparous female.*—Antennæ as follows: III, 1.15 mm.; IV, 0.72 mm.; V, 0.592 mm.; VI, (0.24 mm.+0.24 mm.). Segment III, armed with about 20 circular sensoria in a somewhat even row along the segment. Hind tibiæ somewhat curved, about 2.88 mm. long; hind tarsus 0.224 mm. Cauda and anal plate similar to those of the alate form. Length from vertex to tip of cauda 2.88 mm.

Colour brown. Antennæ and cornicles similar to those of the alate form. Abdomen with transverse brown markings. Eyes red.

*Oviparous female.*—Antennæ as follows: III, 0.928 mm.; IV, 0.512 mm.; V, 0.416 mm.; VI, (0.208 mm.+0.24 mm.). Segment III armed with sensoria as in the apterous viviparous female. Hind tibiæ 1.44 mm. long; slightly swollen and armed with a very large number of rather small, indistinct sensoria; hind tarsus 0.224 mm.; caudal extremity somewhat drawn out into an ovipositor though not prominently so.

Colour as in the apterous viviparous form.

Described from specimens in balsam mounts.

Type in U. S. Nat. Museum.

The two species may be separated by means of the following characters:

A. Unguis of segment VI considerably shorter than the base and about one-tenth as long as segment III; sensoria on segment III on basal half only.....*oblongus.*

B. Unguis of segment III about equal to base and about one-fourth as long as segment III; sensoria on segment III in a row covering entire segment.....*americanus.*

## HOW EMPHOR DRINKS.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

The fact that *Emphor bombiformis* rests upon the water when drinking, mentioned under the above title by Frederick Knab in Proc. Ent. Soc. Washington, Vol. XIII, p. 170, 1911, was observed in 1890 and was recorded in the Canadian Entomologist, Vol. XXII, p. 217. It is fairly certain that the bees were not drinking in the ordinary sense, but that they consisted exclusively of females which were getting water to soften the earth in which they were making excavations for their nests.

Mailed September 10th, 1918.

The Canadian Entomologist.

Vol. L. LONDON, OCTOBER, 1918 No. 10

## POPULAR AND PRACTICAL ENTOMOLOGY.

### The Fruit-tree Leaf-roller (Tortrix argyrospila).

by L. CAESAR, GUELPH, ONT.

It is only during the last five or six years that the Fruit-tree Leaf-roller has been known as a dangerous pest in apple, pear or plum orchards in Ontario. It has evidently, however, been present in the province for many years, for otherwise the writer would not have been able the second year of the outbreak to find it here and there in small numbers in almost every fruit-growing district of the province.

Up to the present time only three bad outbreaks have been discovered, and these all occurred almost simultaneously about six years ago. One of these was in a ten-acre orchard in the county of Northumberland, another in a larger orchard in the county of Wentworth, and the other in a still larger orchard in the county of Norfolk. The history of the insect in each of these three orchards may prove of interest and possibly of some value.

The first two years in all three orchards much damage was done, and the owners estimated that from 20% to 60% of the fruit was ruined. In the third year the insect began to decrease in number in both the Northumberland and Wentworth orchards, and has now almost disappeared from them. In the Norfolk orchard there was also a decrease in the third year and comparatively little injury since until this year, when a large portion of the orchard is once more severely attacked. All surrounding orchards in each of these localities have remained practically free from the pest. This shows clearly its remarkable tendency to localize itself and remain almost exclusively in its chosen abode.

The owners of the respective orchards endeavored on the writer's suggestion to control the insect by very heavy applications of arsenate of lead just before the blossoms opened and again immediately after they fell. After the second season it was seen that arsenicals would not control it, and following the experience

of experimenters in the United States scalecide (a miscible oil) was used both in the Wentworth and Norfolk orchards. Fairly good results were obtained in both orchards, but as this mixture is costly it was used only one season in the Wentworth orchard and two seasons in the Norfolk one. It was then thought that natural agents would probably furnish the work of control and that the insect would gradually disappear. This proved true in the case of the Wentworth orchard just as it had done in the Northumberland, but failed in the Norfolk. It is interesting, therefore, to know that in one locality, even apart from any effective spray, natural foes—parasites, disease and unfavourable weather—were able in a few years to remove or control a very dangerous pest, and that in another district they failed to do so even though aided by an application of one of the most effective sprays known. The explanation probably lies in the fact that there is considerable difference in climate in winter, spring and autumn between Norfolk and Northumberland Counties, and also to a lesser extent between Norfolk and Wentworth Counties. Our studies in Norfolk showed that there were at least two species of dipterous parasites there and four or five species of hymenopterous parasites; so that the persistence of the Leaf-rollers there was not due to the absence of parasites, though cooler weather during the larval stages of the insect may have prevented the parasites from being so active as in the other orchards. This, however, is by no means certain.

Lest fruit growers finding a few rolled leaves with greenish or yellowish green larvæ in them become alarmed and think that they are going to have an attack of this dangerous pest, we may mention that there is another very common Leaf-roller, known as the oblique-banded Leaf-roller which occurs almost every year in small numbers in almost every orchard. The larva of this species is not easily distinguished from its more dangerous relative and, therefore, may easily be mistaken for it. The adult moths, however, are easily distinguished. The proper course in our opinion for fruit growers to pursue is not to worry about the Fruit-tree Leaf-roller until it is known to be present in the orchard and to be doing considerable damage—enough damage to justify special measures. When this state of affairs exists spray the trees very

thoroughly with scalecide or some other good miscible oil a few days before the buds burst. This substance will kill all the eggs that it covers, but to insure that the egg masses are all covered means that the spray must be forced right through the tree to the farthest twigs and branches on the opposite side, otherwise many egg masses situated on the inner side of these twigs and small branches will not be hit. The introduction of the new spray guns makes it a great deal easier to control these insects than it was a few years ago. It should be remembered that each barrel of scalecide should be diluted enough with water to make sixteen barrels of mixture for the orchard, and also that this substance is very effective against San José scale. In nearly every case the scalecide should be used two years in succession to insure full success.

## NOTES ON COCCIDÆ II. (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

As at present constituted, the genus *Sphærococcus* is nothing more than a convenient dumping-place for a considerable number of species that are but little understood—or it were entirely truthful to say not understood at all. The only character that the eighteen or twenty included species are supposed to have in common is that of the absence of hairs on the anal ring. I am informed by Mr. Harold Morrison, who has examined the types of *S. casuarinæ* Maskell, (the type of the genus), that setæ are present on the anal ring of this species, notwithstanding Maskell's assertion to the contrary. In fact, Mr. Morrison is somewhat inclined to believe that this species is nothing more than a species of *Antonina* and certainly the original description and figures support this conclusion. However that may be, some of the species now referred to this genus indubitably have nothing to do with the genotype and must be placed elsewhere. It is probable that but few of these can be assigned to recognized genera.

I am here naming new genera for three of the species now included in *Sphærococcus*. One of these, based upon *S. pulchellus* Maskell, belongs to the group now recognized as the tribe *Asterolecaniini* of the subfamily Dactylopiinæ. The other two, based

upon *S. cupressi* Ehrh. and *S. disticlium* (Kuwana), appear to belong to an unnamed group that includes *Kuwanina parvus* (Maskell) also. I consider this group to be equivalent in value to the groups at present recognized as tribes of the subfamily Dactylopiinæ. Whatever that value may be is certainly questionable for this subfamily, like the genus *Sphærococcus*, is a most unnatural and but little understood group that must eventually be disrupted and reorganized. Pending this upheaval I shall not name the group under consideration, but shall merely indicate as many of its characters as appear to be of value. The group may be characterized as follows:

Coccidæ referable to the subfamily Dactylopiinæ (of the Fernald Catalogue), that is: without abdominal spiracles; end of the abdomen neither cleft nor pygidiform; without a pair of conspicuous lateral prominences. Distinguishable from the other groups of the subfamily chiefly by negative characters. Without dorsal ostioles or cerarii; anal lobes obsolete; without 8-shaped pores; tubular ducts without a filamentous prolongation but bearing at their inner extremity a more or less definitely multilocular pore; anal ring nearly or quite simple, with from two to six very small setæ; antennæ either well developed or vestigial; legs either entirely lacking or well developed.

Included genera: *Kuwanina* Ckll.; *Ehrhornia* new genus; *Paludicoccus* new genus.

Key to Included Genera.

1. Adult female with well developed legs and antennæ, the latter 6-segmented.....*Ehrhornia*, n. gen.
   Adult female without legs and with vestigial antennæ, the latter not more than 3-segmented.....2.
2. Adult female with a pair of small, circular cribriform plates on the ventral side of the abdomen.....*Kuwanina* Ckll.
   Adult female without cribriform plates.....*Paludicoccus*, n. gen.

**Kuwanina** Ckll.

1903. Cockerell, T. D. A., in Fernald, Cat. Coccidæ, p. 101.

Coccidæ of the type described above. Adult female apodous and with the antennæ reduced to mere unsegmented tubercles.

Ventral side of the abdomen with a pair of small, circular, cribriform plates. Dermal pores quinquelocular, somewhat pentagonal in form. Anal ring appearing on the ventral side in the adult female, small, simple, with six small setæ. First stage larvæ with 3-segmented antennæ.

Type of the genus, *Sphærococcus parvus* Maskell.

*Notes.*—The original description of this genus consists merely of a quotation from a letter by Cockerell to the effect that, "Kuwanina differs from Antonina by the larva having 3 or 4-jointed antennæ." It is rather difficult to understand why the genus was compared with *Antonina* rather than with the type of the genus from which it was removed.

### **Kuwanina parvus** (Maskell).

1897. *Sphærococcus parvus* Maskell, Ent. Mon. Mag., vol. 33, p. 244.

1897. *Sphærococcus parvus* Mask.; Maskell, Trans. N. Zealand Inst., vol. 30, p. 247, pl. 27, figs. 9-11.

1902. *Sphærococcus parvus* Mask.; Kuwana, Proc. Calif. Acad. Sci, ser. 3, vol. 2, p. 56.

1903. *Kuwanina parvus* (Mask.); Ckll., in Fernald, Cat. Coccidæ, p. 121.

1915. *Kuwanina parvus* (Mask.); Green, Ent. Mon. Mag., vol. 51, p. 181, figs.

There is little to add to the description given by Green, other than to note that the pores are borne at the inner end of short ducts and that the derm of the abdomen presents a curiously roughened appearance. I have examined specimens from the material recorded by Kuwana in 1902. Mr. Morrison has sent me sketches made from the type of the species and these leave no doubt as to the correctness of the determination.

### **Ehrhornia,** n. gen.

Coccidæ of the type described above. Adult female with well developed legs and antennæ, the latter 6-segmented. Ventral side of the abdomen without cribriform plates. Dermal pores for the most part circular and without distinct loculi. Anal ring appearing on the ventral side in the adult female, small, simple

and with from two to six small setæ. Larva with 6-segmented antennæ.

Type of the genus: *Sphærococcus cupressi* Ehrh. The genus includes also a second species, herein described as *E. graminis*, n. sp. The genus is named in honour of Mr. E. M. Ehrhorn.

### Ehrhornia cupressi (Ehrh.)

1911. *Sphærococcus cupressi* Ehrhorn, Can. Ent., vol 43, p. 277, figs. 3, 3 a, b, c.

This species will be redescribed at length in a forthcoming paper by Mr. F. B. Herbert, of the Bureau of Entomology, and I shall merely note that the original description is in error in regard to the statement that the anal ring is hairless. The anal ring has six small setæ.

### Ehrhornia graminis, n. sp.

(Fig. 12.)

*In life.*—Occurring in cracks and beneath scales on the root stock of the host; of a bright yellow colour; surrounded by more or less flocculent secretion.

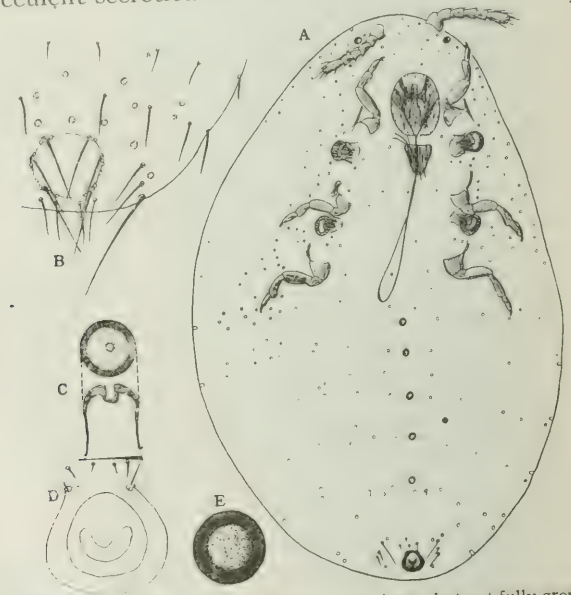


Fig. 12.—*Ehrhornia graminis*, n.sp.: A, female in last instar but not fully grown; B, posterior end of abdomen of first stage larva; C, dermal pore; D, anal ring of adult; E, large pore of the median ventral series.

*Morphological characteristics.*—Length of largest specimen (flattened on slide) 2.8 mm. Mounted specimens pyriform or circular. Adult female with well developed legs and with 6-segmented antennæ, the last segment longest. Derm membranous throughout except for some irregular chitinization in old individuals. Anal ring (in specimens flattened on the slide) appearing on the ventral side of the body, in old individuals at some distance from the posterior margin, quite small, heavily chitinized, non-cellular, bearing 2 small setæ. Body destitute of all but a very few extremely minute setæ and three slender setæ on each side of the anal ring. Dermal pores quite numerous, all circular, the majority borne at the inner end of short ducts. On the ventral side of the abdomen there is a median, longitudinal row of five quite large, sessile pores.

First stage larva with six-segmented antennæ. Body beset with many slender setæ, especially toward the posterior end. Anal ring simple, bearing six long setæ. Anal lobes lacking. Dermal pores numerous, circular, multilocular or occasionally trilocular.

*Type host and locality.*—From an undetermined species of perennial grass growing on the ridge about a mile east of the reservoir at Pacific Grove, Monterey County, Calif., Dec. 1, 1917. Collected by the author.

### **Paludicoccus,** n. gen.

Coccidæ of the type described above. Adult female apodous and with the antennæ reduced to mere stubs, three-segmented. Ventral side of the abdomen without cribriform plates. Anal ring quite heavily chitinized, normally with 6 small setæ. Dermal pores circular and without distinct loculi. First stage larva with 6-segmented antennæ. Adult male apterous; antennæ 8-segmented.

Type of the genus; *Sphærococcus disticlium* (Kuwana).

### **Paludicoccus disticlium** (Kuwana).

1902. *Pseudolecanium disticlium* Kuwana, Ent. News, vol. 13, p. 134, figs. 1, 2.

1903. *Sphærococcus disticlium* (Kuw.); Fernald, Cat. Coccidæ, p. 85.

The descriptions and figures given by Kuwana are in general

quite satisfactory, but there remain certain very important details that were overlooked.

The anal ring is not hairless, as was stated in the description, but bears six very small setæ. Due to the heavy chitinization of the body these are usually somewhat difficult to see. The antennæ are 3-segmented. The dermal pores are in part trilocular but the majority are circular. The circular pores are in part multilocular and sessile and in part without distinct loculi, those of the latter type being borne at the end of short ducts.

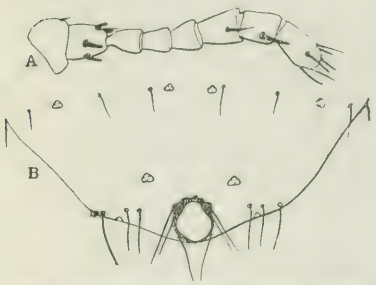


Fig 13.—*Paludicoccus distichium*( Kuwana): A, antennae of adult male; B, posterior end of abdomen of first stage larva.

In the first stage larva the anal ring bears six slender hairs, not "four spiny hairs." The second stage differs from the adult only in the membranous condition of the derm and the smaller spiracles.

The adult male is apterous. The antennæ are 8-segmented and somewhat clavate. The body is entirely destitute of hairs except for a group of three long setæ on each side at the posterior end of the abdomen. The eyes each consist of a dorsal and a ventral ocellus, the former the larger.

*Material examined.*—Type and topotype specimens.

### **Callococcus**, n. gen.

Coccidæ referable to the tribe Asterolecaniini of the subfamily Dactylopiinæ (of the Fernald Catalogue). Adult female apodous and with the antennæ reduced to mere chitinized points. Anal lobes lacking. No stigmatic clefts or stigmatic spines. Anal ring extremely obscure—apparently hairless. Pores of the 8-shaped type confined to a longitudinal row which extends along the median line of the dorsum from one end of the body to the other. Derm with many tubular ducts of the type common to the tribe, these especially numerous along the median line of the dorsum.

First stage larva without anal lobes; with the anal ring extremely minute and hairless; 8-shaped pores large, confined to the margin of the body; antennæ 4-segmented.

Type of the genus: *Sphærococcus pulchellus* Maskell.

*Notes.*—Although this genus appears to be unquestionably Asterolecanine it differs markedly from any other known to me. I can say nothing in regard to its relationship with the other members of the group.

## **Callococcus pulchellus** (Maskell).

1896. *Sphærococcus pulchellus* Maskell, Trans. N. Zealand Inst., vol. 29, p. 324, pl. 21, figs. 10-13.

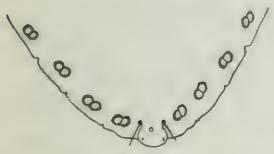

Fig. 14.— *Callococcus pulchellus* (Maskell): posterior end of abdomen of first stage larva.

The adult female of this species is enclosed in a pretty, waxy covering that has been well described by Maskell.

*Morphological characteristics.* — Adult female merely an elongate, oval sac, without appendages of any sort. Anal lobes entirely lacking, their position not indicated by setæ. Anal ring probably very minute and hairlesss, a it does not appear even in well stained preparations.

Derm membranes except for a narrow, somewhat irregular, longitudinal, chitinized area extending the full length of the body along the median line of the dorsum. This area appearing only in fully mature individuals. Derm with many rather short, tubular ducts, these especially numerous along the dorsal area just described. Pores of the 8-shaped type extremely minute and inconspicuous, confined to a row which extends along the median line of the dorsum from one end of the body to the other. In the fully mature insect this line of pores is almost entirely obscured by the chitinization of the dorsum.

First stage larva with 4-segmented antennæ. Anal lobes lacking, the posterior end of the abdomen pointed. Anal ring extremely minute, hairless. Derm destitute of hairs and with a single, marginal row of large, 8-shaped pores.

*Material examined.*—Specimens determined by Froggat as this species and agreeing in all respects with the original description.

**Mycetococcus,** n. gen.

Coccidæ referable to the tribe Asterolecaniini of the subfamily Dactylopiinæ (of the Fernald Catalogue). Adult female apodous and with the antennæ reduced to mere unsegmented tubercles. Body top-shaped, ending in a pair of prominent lobes, which, together with the last segment of the abdomen, are heavily chitinized.

Type of the genus: *Cerococcus ehrhorni* Ckll. *Cerococcus corticis* Towns. and Ckll., also included.

*Notes.*—The description here given will doubtless appear extremely short, but the characters enumerated are the only ones that the two species included have in common. Although the two are very similar in general appearance and occur upon hosts of the same genus, I am unable to avoid the conviction that they are not congeneric and perhaps should not even be referred to the same group. It has seemed best, however, to place them together until the value of the characters that seem to separate them has been more fully investigated. These differences will be discussed under the species. Neither of the species can be considered as having anything in common with the genus *Cerococcus* to which they have been referred. The first stage larvæ are very different from those of typical *Cerococcus*, the adults lack the "cauda" between the anal lobes and the cribriform plates of the latter genus while the heavily chitinized anal lobes and terminal segment of the abdomen are quite distinctive.

**Mycetococcus ehrhorni** (Ckll.).

(Fig. 15 A.)

1895. *Cerococcus ehrhorni* Ckll. Psyche, vol. 7, p. 255.

1901. *Cerococcus ehrhorni* Ckll.; Patterson, Proc. Calif. Acad. Sci., ser. 3, vol. 2, p. 387, pl. 22, figs. 1-9.

A sufficiently accurate general description of the insect will be found in the papers of Cockerell and Patterson, but there are certain details that have been overlooked.

The derm in the adult female bears numerous small, 8-shaped pores and a very few, extremely minute and delicate tubular ducts that appear to be of the type common to the Asterolecanine forms.

There are no trilocular pores. The anal ring appears to be very small and is entirely obscured by the heavily chitinized anal lobes.

In the first stage larva the anal ring is extremely small and appears to bear but four very minute setæ. The terminal segment is not chitinized. There are marginal and two submedian, longitudinal rows of 8-shaped pores. The antennæ are five-segmented.

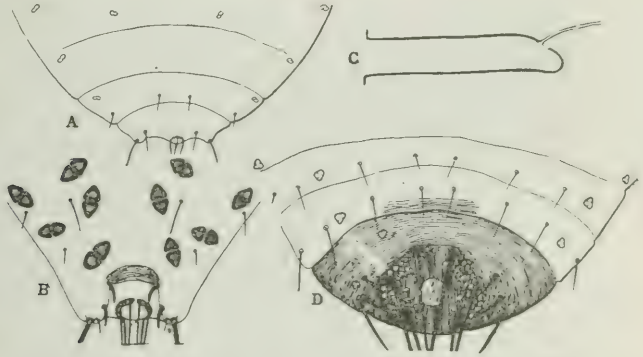


Fig. 15.—A, posterior end of abdomen of first stage larva of *Mycetococcus ehrhorni* (Ckll.); B, posterior end of the abdomen of *Cerococcus bryoides* (Maskell); C, tubular duct of *Mycetococcus corticis* (Towns. & Ckll.); D, posterior end of the first stage larva of *M. corticis*.

## **Mycetococcus corticis** (Towns.).

(Fig. 15 C., 15 D.)

1898. *Cerococcus corticis* Towns. & Ckll., Jn. N.Y. Ent. Soc., vol. 6, p. 170.

1901. *Cerococcus corticis* Towns. & Ckll.; Patterson, Proc. Calif. Acad. Sci., ser. 3, vol. 2, p. 387, pl. 23, figs. 23-28.

As in the case of *M. ehrhorni* there are certain details that former authors have overlooked.

The derm in all stages is entirely destitute of 8-shaped pores. In the adult there are numbers of quite large, tubular ducts of a type quite unlike that usually found in the Asterolecaniinæ and, in fact, unlike any that I have seen. This peculiarity arises from the fact that the delicate filamentous prolongation of the duct arises some distance before the apex of the larger portion. The anal ring is quite large and cellular.

The first stage larva bears a few trilocular pores instead of 8-shaped pores. The anal ring is very large, heavily chitinized and

cellular and bears six large setæ. The terminal segment of the body is strongly chitinized. The antennæ are 6-segmented.

*Material examined.*—Specimens from the type material.

### **Cerococcus ovoides** (Ckll.)

(Fig. 16.)

1901. *Pollinia ovoides* Ckll., The Entom., vol. 34, p. 225.

1909. *Pollinia ovoides* Ckll.; Green, Coccidæ Ceylon, pt. 4, p. 340.

The description given by Cockerell needs to be amplified at several points.

Fig. 16.— *Cerococcus ovoides* (Ckll.); dorsal aspect of anal lobes of adult female, anal ring and setae not indicated.

The adult female is in general form entirely like the other members of the genus to which I am referring the species. Legs entirely lacking. Pores of the 8-shaped type small, confined to a narrow zone extending about the body at the lateral margin. Tubular ducts abundant, small, slender, usually presenting an elbowed appearance. Two pairs of cribriform plates present, the members of each pair close together. Anal ring with 10 setæ. Anal lobes quite small, their mesal margins but slightly chitinized. Between the lobes is the characteristic "cauda" of the genus.

Cockerell states that the antennæ of the first stage larva are 6-segmented, but all the specimens examined by me show but 5 segments. The matter is not especially important as the first stage larva in other species of this genus may show either 5 or 6 segments. The 8-shaped pores of the dorsum are much smaller than those of the marginal series.

*Specimens examined.*—Part of the type material.

*Notes.*—Green has already pointed out (ref. cited) that this species appears to be close to *Cerococcus*. I am unable to find any basis for separating it generically from *C. quercus*.

# SYNOPSIS OF THE GENUS TEGRODERA.

(Order, Coleoptera; Family, Meloidæ.)

BY FRANK E. BLAISDELL, SR., SAN FRANCISCO, CAL.

Recently while studying the Meloidæ in the collection of the California Academy of Science, San Francisco, a small series of ten specimens of a form of *Tegrodera* from Arizona was studied and considered worthy of a name. It is a race of *Tegrodera erosa* Lec., and its description will give an opportunity to review the genus as a whole. The species and races of *Tegrodera* have never been brought together in one paper, and the present time seems to be very opportune for so doing.

The genus *Tegrodera* was erected by Le Conte. It is characterized by having the penultimate joint of the tarsi cylindrical, the lower portion of the claws shorter than the upper and connate; the labrum is emarginate and the body glabrous.

The species and races may be separated as follows:

Elytral reticulations small and close; transverse fascia broad, subequal in width and distinct; meshes more or less pale to black.....*laticincta.*

Elytral reticulations coarse and well separated; transverse piceous fascia variable.

Transverse fascia obsolete, reduced to a subtriangular marginal blotch; meshes yellow.....*inornata.*

Transverse fascia narrow, more or less constricted at middle of each elytron, sometimes divided into a marginal and sutural subtriangular blotch; meshes piceous black.

Suture pale, sometimes blackish in basal third, meshes black.....*erosa.*

Suture black, meshes decidedly black as a rule, the black tending to diffusion.....*aloga.*

**Tegrodera erosa** Lec.—Head red, pronotum black or varied with red. Elytral reticulations very coarse; colour pale orange yellow with the tips always piceous for a short distance. Legs and under surface of the body black.

In the male the oblique frontal grooves and fovea of the vertex are strong; the median frontal fovea is similar in

development. The last abdominal segment is slightly emarginate at apex.

Length 16.0–27.0 mm.

Typical *erosa* is very abundant in Southern California (San Diego Co.) and Northern Lower California. It is markedly gregarious in large or small companies. In the author's boyhood days the insect was known as the "soldier-beetle" in Poway Valley (twenty-five miles northeast of San Diego.) This name was given to it on account of the peculiar habit they have, when disturbed, of raising the elytra and wings perpendicularly, showing the bright red of their upper abdomen and walking as high as possible on their legs. The red head, red abdomen and yellow elytra, with the bandy-legged way of marching and falling into single file—one after the other, gave a peculiar soldier-like aspect to their actions.

*Erosa* apparently feeds upon various plants. The author's mother—Mrs. Anna G. Blaisdell—states that in 1907, when collecting a large series on Kent's Ranch at Poway, a large alfalfa field was inhabited by thousands of this beetle, feeding upon the alfalfa. Mr. L. Kent, owner of the ranch, stated that the tumbleweeds (a species of *Amaranthus* that grows to an immense size and is blown about by the wind in the fall of the year) are completely defoliated by them.

In those individuals of *erosa* in which the transverse piceous-black fascia of the elytra becomes more or less obsolete, the meshes remain black and do not become pale as in *inornata*.

*Habitat.*—California (Poway, San Diego Co., July 5th, elev. 700 ft., Soboba Springs, Riverside Co., June; E. P. Van Duzee, collector). Lower California (Tia Juana).

*Bibliography.*—Annals Lyceum, V, 159; Trans. Amer. Ent. Soc., June, 1870, p. 93; Trans. Amer. Ent. Soc., XVIII, Feb., 1891, p. 390.

**Tegrodera inornata**, n. var. (A race of *erosa* Lec.). Head red, prothorax rufo-piceous to black varied with red. Elytra very coarsely reticulate, middle transverse band entirely wanting, except a small sub-triangular marginal blotch, meshes always yellow.

Dr. Horn mentions a pale form taken by Mr. Gabb in Lower California. During fourteen years residence in Poway Valley, the author never saw a completely pale form of *erosa* Lec., although

the transverse piceous band was at times very much reduced and subobsolete, but in these individuals the elytral meshes were always black. *Inornata* is described so as to correlate the variants of *erosa* more exactly.

Length 23.0–27.0 mm.

Holotypes are in the collection of the California Academy of Sciences. Paratypes are in the author's collection.

*Habitat.*—Arizona. Exact locality has not been recorded on the specimens studied.

**Tegrodera aloga** Skinner.—(A race of *erosa* Lec.) Head red, antennæ and collar black. Thorax red or variegated with black. Elytra bright yellow, reticulate; black between the reticulations, with apices black. There is a transverse piceous fascia, constricted in the middle of each elytron. Elytral suture black. Abdomen and legs black. Length 14.0–26.0 mm.

*Habitat.*—Near the banks of the Gila River, near Florence, Arizona. Collected on May 4th, 1903, by Mr. C. R. Biederman.

Holotypes in the collection of the Philadelphia Academy of Natural Sciences.

Dr. Skinner states that his series of sixteen specimens shows no variations, except in size. It differs from *laticincta* Horn in being more coriaceous, the reticulations being much coarser and showing the background more conspicuously. The transverse elytral fascia in *laticincta* is wider and not constricted in the middle of each elytron. It may be distinguished at once from *erosa* Lec. by the distinct, black suture.

*Bibliography.*—Ent. News, vol. XIV, No. 6, June, 1903, p. 168.

**Tegrodera laticincta** Horn.—Head red, pronotum black or varied with red; antennæ black. Elytral reticulations more or less close, with a rather wide and exactly transverse piceous fascia at middle; meshes variable as to colour in the same individual, pale to black, general colour being yellow; piceous area at apex better indicated.

Length 19.0–22.0 mm.

*Habitat.*—California (Owens Valley; type region (Horn). Freeman and Bishop, Inyo Co., June, Dr. A. Fenyes collector).

*Bibliography.*—Trans. Amer. Ent. Soc., XVIII, Feb., 1891, p. 390.

# NEW AND LITTLE-KNOWN CANADIAN OSCINIDÆ.*

BY J. M. ALDRICH, BUREAU OF ENTOMOLOGY,
U. S. DEPT. OF AGRICULTURE.

In 1915 and 1916 the writer received for study many lots of small flies swept by Mr. Norman Criddle at Aweme and Treesbank, Manitoba, on grains and grasses. In a few cases he added material from other points. These accumulations came to represent the Oscinid fauna of the region quite fully, and to contain several undescribed species in some numbers. It is the purpose of the present paper to describe a few of the most abundant species and to clear up some obscurities about several genera and species; it does not by any means exhaust the material which Mr. Criddle furnished with infinite industry, persistence and patience.

Type material in all the species will be deposited in the Canadian National Collection, and also in the United States National Museum.

## Lasiosina Beck.

This genus, described by Becker in 1910 in the first part of his Monographie der Chloropiden (Archivum Zoologicum, 1, 73), has for its type *Chlorops cinctipes* Meig. (*Diplotoxa inconstans* Lw.), and originally included two other European species. Two of the three had been described in Diplotoxa by Loew, the other being new.

The genus, therefore, represents a subdivision of Diplotoxa, from which as restricted it differs in having longer thoracic and frontal bristles, and the cross veins less approximated, separated by about twice the length of the hind one.

Becker did not see any North American material. The first species to be found on this continent was a single female from Springer, N.M., in the National Museum, which Malloch described (Proc. U. S. N. M., XLVI, 140, 1913) as *Euchlorops similis*, placing it in the Milichinæ. From *Euchlorops vittata*, the type species of the genus, *similis* differs in having but one dorsocentral bristle, the former having a row of four. I have examined both types and also the European *L. albipila* Lw., the last in Professor Melander's collection. We have a common northern species which has come into my possession only since I saw the type of *similis;*

I am indebted to Mr. Chas. T. Greene for making comparisons with the latter, from which I conclude that it is a distinct species.

**Lasiosina canadensis,** n. sp. (Figs. 17, 18, 19).

Front more than half the head-width, flat, somewhat projecting over antennæ, pale yellow in colour, with the following pairs of bristles, large for the family: 3 and sometimes 4 fronto-orbitals; 1 divergent ocellar; 1 convergent post-vertical or post-ocellar; 1 inner vertical, strongly convergent, just outside the hind angle of triangle; 1 outer vertical, strongly divergent, on a slight swelling farther back than preceding; there are also 40 or 50 small black hairs, mostly on the anterior half of front, of which one or two pairs near the median line may be a little larger. Triangle distinct, of moderate size, its sides convex, the apex drawn out in a slender point which almost reaches the extreme anterior edge of the front; ocellar dot black, connecting with black of occiput, rest of triangle dark yellow to brown, subshining, often with darker margin. Face and bucca light yellow, the latter over half the eye-height; eye strikingly elongated lengthwise of the head; antennæ of moderate size, yellow, in the female the third joint wholly infuscated, in the male it is largely or wholly yellow, the infuscation usually confined to a spot at base of arista; the latter black, bare, Palpi yellow in male, distinctly brown in female. A pair of small, pale vibrissal hairs. Back of head yellow except centrally and directly behind the posterior curve of eye.

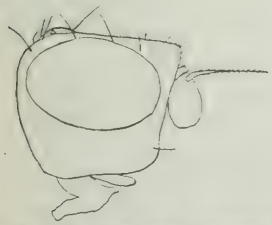

Fig. 17.— *Lasiosina canadensis*, head of male, side view.

Fig. 18.—Same from above.

Thorax opaque yellow to reddish, the notum with three broad opaque black stripes, the middle one narrowed or abbreviated behind, lateral ones distinctly shortened in front, not connected with the dark of humeri; scutellum yellow, its sides blackish; postnotum dull black; pleuræ with a shining black spot on lower edge

of mesopleura and a larger on the sternopleura, the latter, however, opaque below; an opaque black spot on pteropleura and one above hind coxa. Halteres white. The bristles of the thorax are as follows: humeral 2–3; notopleural 3; postalar 1; posterior dorsocentral 1; scutellum 2 pairs, the outer small.

Abdomen rather uniform subshining brown above, the last segment more or less yellow; the hairs are pale except along the sides apically and on last segment, the male showing more dark then the female; male hypopygium black, shining.

Legs dark yellow including tarsi, but there is some tendency to a dark ring on hind tibiæ and to a vague darkening of the front tarsi and the basal half of hind femora.

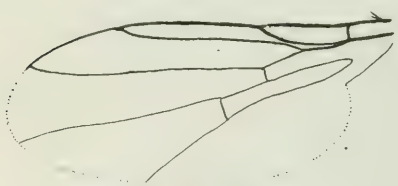

Fig. 19.—Same species, wing.

Wing subhyaline, venation as in Chlorops; the distance between cross veins is from 1½ to 2 times the hind one.

Length 2–2.6 mm.

Eleven males and twenty-two females. The male is from Ogema, Sask., June 16, 1916;. Paratypes are from Ogema (6) and Estevan (2), Sask.; Treesbank and Aweme, Man., (18); Sheridan, Wyo., (1, Metz); Pullman, Wash., (1, Melander); Bovill, Ida., (1, Melander); Powell Co., Mont., (1, Mann); and Saranac Lake, N.Y., (1, Johannsen).

The type of *similis* Mall. is in general very similar, but although a female it has the antennæ and palpi coloured as in the male of *canadensis*, and "tibiæ darkened from near base, becoming black at apices; tarsi black."

The European *cinctipes*, type of the genus, has the same sexual distinctions in the colour of antennæ and palpi as in *canadensis*, or essentially the same.

### Dicraeus Loew.

This genus was established in Berl. Ent. Zeitsch. in 1873 (XVII, 51) for the single species *obscurus*; Becker (Mon. Chlor. I, 111, 1910) regards this as synonymous with *raptus*, Haliday

(Ann. Nat. Hist., XXII, 187, 1838, as Oscinis). Thus the type species becomes *Dicræus raptus* Hal. Loew gives as generic characters that the costa ends before reaching the fourth vein, the hind cross vein is absent, and the second vein is straight, unusually long, and parallel with the third. He placed it in Chloropinæ on the costal character. Becker (op. cit., 109) finds five species of the genus in Europe, of which only one lacks the hind cross vein, while three have the costa fully reaching the fourth vein. Thus he makes absence of the cross vein only specific (Strobl, in Tief's Nachlass, 64, 1901, had argued that it is merely varietal); and what is more surprising, he reduces to specific value in this little group the costal character also, which elsewhere in the family is decidedly of subfamily importance, and has been so considered by Becker himself (the first dipterist to make use of the character was Fallén, Oscinides, 1820, p.3; he separates two groups of his genus Oscinis by it). In Becker's use of Dicræus, the chief generic character is the unusually long second vein; he places the genus, I think correctly, in Oscininæ close to Oscinis.

In his treatment of the nearctic Oscinids (Mon., IV, 103, 1912), Becker mentions the European *Dicræus ingratus* Loew (Zeitsch. f. Ent. Breslau, XX, 26, 1866, as Eutropha) as occurring in Idaho and Washington, but says the specimens have a little shorter second vein than the European. However, on examining my two Idaho specimens returned by him, I find that they have the costa evidently reaching the fourth vein, so they would not go to *ingratus* in Becker's own table of the European species. The same is true of all but one of about 70 specimens that I have since accumulated. The character is possibly not of specific value, though so taken by Becker. I have not seen European material, and the case is not free from doubt; but in view of the discrepancies and the geographical separation I believe myself justified in describing ours as a distinct species. The figure of the wing shows the course of the second vein, which is the main generic character; the rest is included in the description.

**Dicræus incongruus,** n. sp. (Fig. 20).

Shining or subshining black robust species. Frontal triangle subshining, not very distinctly bounded, ending acutely at about

the second third of the front; anterior third or more of front broadly yellow; antennæ dark yellow, third joint small, round, with darker upper edge or more; arista short, bare; face, epistoma and bucca yellow, the last with narrow shining black lower edge, the dark line continuing up nearly to the antenna, between the parafacial and central part of face; bucca from one-fourth to one-third the eye-height; palpi brown; edge of mouth black; proboscis small, blackish; eyes round, bare; back of head black. Front with four or five minute orbitals; ocellars minute, erect, convergent.

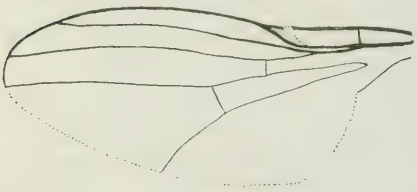

Fig. 20.—Dicraeus incongruus, wing of female.

Mesonotum shining black, yet with very thin, delicate pruinosity, the abundant minute hairs not arranged in rows, and no noticeable punctures. Chætotaxy: dc. 1, hum. 1, stpl. 3, postal. 2, sc. 2 pairs nearly equal, erect. Pleuræ shining black except upper hind part of mesopleura and the region behind and just below the wing. Halteres lemon yellow with brown stem. Scutellum concolorous with mesonotum.

Abdomen black, not very shining, with only a few hairs, which are black; the male has a polished, knob-like black genital segment, from which project forward a pair of long, stout, nearly straight black forceps, reaching almost to the hind coxæ, very characteristic.

Coxæ, trochanters, and femora black, the knees narrowly yellow; hind tibiæ black to tip, a little widened, not with "sense organ;" fore and mid tibiæ yellow to brownish, tarsi wholly yellow.

Wings distinctly milky, veins black, the fifth paler, especially its last segment; the first vein is merely a light streak in the wing, invisible except in favourable light, at its apex the costa is broken more distinctly and widely than in any other Oscinid that I know. As this wide break is shown in Becker's figure of the type species, it is probably of generic importance. Venation as figured. In order to determine the trustworthiness of the costal character, I measured with eye-piece micrometer the distance between the tips of the first and second veins, and between the second and third,

dividing the former by the latter. This I did with five specimens of each sex: the males gave 2.63; 2.70; 2.75; 2.81; and 2.20,—average 2.62;—while the females gave 2.75; 3.50; 3.50; 3.00; and 4.00,—average 3.35.

Length 1.5 to 1.7 mm.

Seventy-five specimens, both sexes: 68 from Treesbank, Man., (Criddle); 2 Moscow, Idaho, determined by Becker as *Dicræus ingratus;* 1 Potlatch, Idaho; 1 Emigration Canyon, Utah, back of Salt Lake City, about 7,000 feet; 3 Powderville, Mont., (R. R. Parker). The Potlatch specimen is dated June 20, the rest all in July.

ELACHIPTERA PLANICOLLIS, Beck.

Becker, Mon. Chlorop., IV, 114, 1912 (Oscinella).—Collins, Ida. (By mistake Collins, Texas).

The type is in Professor Melander's collection, and until I saw it in 1916 I failed to identify the species, having it in my collection as *Elachiptera n. sp.* It is in reality very closely allied to the abundant *Elachiptera longula*, having the same elongated shape, diagonal eye, flattened thorax and scutellum; but differing in having the arista not thickened and all the femora black. The colour as in *longula* is opaque, but inclines more to plumbeous. As far as the aristal character is concerned, there is a little variation in the thickening in both species, so I have specimens running together in this respect. Becker placed *longula* in Melanochæta, in which he also placed *aliena*, a species having a plain arista like that of *planicollis;* but at the same time he admitted that there was no natural line of division between Elachiptera and Melanochæta, either in the European or North American fauna.

My specimens of *planicollis* are the following: 26 from Treesbank and Aweme, Manitoba, collected by Mr. Criddle from June to September; 4 from Chatcolet, Idaho, August 15, collected by Professor Melander; and 1 from Waubamic, Ont., near Parry Sound, collected by H. A. Parish.

**Oscinis criddlei,** n. sp. (Fig. 21.)

A black species with the fore and middle tibiæ and all the tarsi wholly yellow, and the third antennal joint subangulated above at apex.

Eyes hairy; frontal triangle shining black, short, ending in an acute angle about the middle of the front; rest of front opaque, blackish, the lower part sometimes indistinctly paler; antennæ black, third joint reddish on inner side, rather large and of very characteristic shape, almost angulated above apically; arista bare; epistoma and bucca varying from dark yellow to brown, the latter about one-fourth the eye-height; palpi black; proboscis small, short, dark; occiput black. Thorax and scutellum above subpollinose, gray, the black ground colour very evident, shining through; the pollen of dorsum extends down over the hind part of the mesopleura, and also behind the wing to the halter, which is yellow; rest of pleura shining black; scutellum with a pair of good-sized bristles at apex, and a much smaller pair outside and higher. The mesonotum has short, stout, brown hairs, rather scattered; in strong light they look pale. Abdomen black above, generally more brownish basally, with scattered pale hairs. Coxæ, femora and middle of hind tibiæ black; trochanters, tips of femora, front and middle tibiæ, all but middle of hind tibiæ, and all tarsi to their tips, yellow; claws black. Wings hyaline, veins rather pale, venation ordinary; tip of second vein at 3/5 the distance from the first to the third.

Fig.21.—Oscinis criddlei, antenna, inner side.

Length 1½ mm.

Fifty-eight specimens, both sexes, all taken in July and August at Treesbank and Aweme, Manitoba, by Norman Criddle, in whose honour I name the species in appreciation of his active and continued assistance in my work on flies of this family.

### Oscinis scabra, n. sp.

An opaque gray, short, broad species allied to *trigramma*, but not vittate. Front almost one-half the head-width, square, the short, opaque triangle blending with the rest, lower half of front yellow, slightly prominent above antennæ, the whole surface punctured except close about ocelli, the setæ very short, hardly visible; antennæ yellow, third joint orbicular, infuscated on apical half, arista short, bare; palpi yellow, proboscis small, retracted; bucca yellow, one-third the eye-height; back of head opaque gray.

Thorax short and broad, square, flat, densely gray pollinose on black ground, with distinct, close punctures which are not arranged in rows and bear only minute hairs, giving the mesonotum a bare appearance; the lateral setæ very short but stout; scutellum a little elongated, flat, punctured and concolorous with dorsum, with only one pair of apical setæ of noticeable size; pleuræ black, gray-pollinose except in the depressions above the front and hind coxæ; postnotum shining black; halteres yellow.

Abdomen subshining black above, indistinctly paler basally, opaque black below.

Legs including coxæ opaque black, the knees vaguely, the tibiæ except a broad, median ring on middle and hind ones, and all the tarsi yellow.

Wings subhyaline, veins blackish, the costal segment before the tip of second vein less than double the one beyond it.

Length 1.3 to 1.5 mm.

Thirteen specimens, both sexes: ten from Treesbank, Manitoba, May 6, 1916, including the type, a female; two Aweme, Manitoba, Sept. 12 and Oct. 13, 1916; one Estevan, Saskatchewan, May 20, 1916. All collected by Norman Criddle.

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## NEW HALICTINE BEES FROM CHILE.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

The Chilean bee-fauna is one of the most remarkable in the world, many of the species having a facies quite distinct from those of other parts of South America. Many species were long ago described by Spinola; others have been made known at intervals since, but there can be no doubt that very many remain to be discovered.

**Agapostemon (Pseudagapostemon) xanthorhinus,** sp. n.

♂.—Length about 7.5 mm.; anterior wing 5.5; bluish-green; clypeus (except two dots and narrow lateral margins), labrum and mandibles (except black basal spot and ferruginous apex) yellow; a yellow stripe across tubercles; legs bright yellow, with the coxæ, trochanters, anterior femora basally, middle and hind femora

largely behind (but not apically), piceous; clypeus produced, but ordinary; sides of face with dense, appressed, very pale yellowish hair; front dull and granular; antennæ long, the scape and two following joints yellow, the others pale ferruginous, the flagellum more or less dusky above, especially at base; fourth antennal joint about as long as second and third together; mesothorax and scutellum densely punctured but shining, with thin, rather long, pale hair; basal area of metathorax covered with coarse, vermiform rugæ; tegulæ pale, with a yellow spot; wings hyaline, stigma pale ferruginous, nervures testaceous; first recurrent nervure joining second submarginal cell beyond the middle; hind legs not modified; abdomen closely punctured but shining, with thin hair, but no bands; apical segment pale reddish, emarginate; venter mainly yellow, hind margin of fourth segment broadly W-like, the margins of the notch ferruginous.

Chile (E. C. Reed), U. S. Nat. Museum. Closely related to *A. citricarnis* (*Halictus citricarnis* Vachal), but that species differs by the somewhat greater size, the presence of yellow depressed hair on abdomen, the granular area of metathorax, the yellow antennæ, and the slightly emarginate fourth ventral segment. Also related to *A. paulista* (*Pseudagapostemon paulista* Schrott.), but differs in being smaller, with yellow mandibles. It has the clypeus yellow with two dots, as in *A. paulista*, not as in *A. nasua* (*Pseudagapostemon nasua* Schrott.). It does not seem advisable to regard *Pseudagapostemon* as more than a subgenus.

**Rhopalictus corinogaster chilöeensis,** subsp. n.

♀.—Wings dusky, nervures pale fuscous; tegulæ black, anteriorly margined with testaceous; legs and antennæ darker; abdomen darker red, first segment black except the broad, apical margin.

Island of Chilöe, Dec., 1894. Collector unknown. Type in my collection.

**Rhopalictus callicladurus,** sp. n.

♂.—Length about or nearly 9 mm.; head and thorax metallic green, with abundant white pubescence; labrum, mandibles and apex of clypeus pale testaceous; eyes deeply emarginate and

strongly converging below; antennæ very long, the rather swollen scape black; the flagellum ferruginous, dusky above, strongly crenulate; front, sides of thorax and metathorax blue-green, but face, mesothorax and scutellum yellowish green; mesothorax finely punctured but moderately shining; area of metathorax with radiating plicæ, more or less connected by cross-ridges; tegulæ pale testaceous; wings ample, hyaline, stigma and nervures sepia; first recurrent nervure joining second submarginal cell very near end; tibiæ and tarsi, and much of apical part of femora, bright ferruginous, but femora otherwise green; abdomen clavate, long and slender, first segment swollen dorsally; first segment practically black above, second and third very bright ferruginous, fourth and fifth deep metallic green with hind margin red, apex red.

Chile (*E. C. Reed*), U. S. Nat. Museum. Easily known by the peculiarly coloured abdomen, but nearest to *R. corinogaster* (Spinola).

### Rhopalictus melanocladus, sp. n.

♂.—Length about 8.5 mm.; head and thorax black, with white hair, the entirely dull and granular front, vertex, mesothorax and scutellum with a faint greenish tint; clypeus and labrum black, mandibles dark reddish beyond middle; eyes deeply marginate and strongly converging below; antennæ extremely long, black, the flagellum dark coffee-colour below, and strongly crenulate; area of metathorax strongly reticulate; tegulæ dark rufo-fuscous; wings brownish-hyaline, stigma and nervures dusky-ferruginous; second submarginal cell not very broad, receiving first recurrent nervure a short distance from its end; legs black, with the long tarsi; pale ferruginous; abdomen elongate, clavate, first segment swollen dorsally, but its apical part in a straight line with second (which is not true of *R. callicladurus*); abdomen black, with a very faint greenish tint, hind margins of segments obscurely reddish; apex pale ferruginous.

Chile (*E. C. Reed*), U. S. National Museum. Related to *R. chilensis* (Spin.), the type of the genus, but readily distinguished by the dark abdomen and the shape of the second submarginal cell.

## AFRICAN BUPRESTIDÆ (COL.) OF THE GENUS STERNOCERA.

BY RICHARD T. GARNETT, BERKELEY, CAL.

The following table will separate the various forms of *Sternocera interrupta* Olivier:

I. Impressions of elytra present.
  A. Foveæ of thorax and elytra with white pilosity.
    B. Beneath dull bronze, above black; elytra black or dull castaneous, lighter punctured.....*S. interrupta* Olivier.
    BB. Entirely dull bronze; elytra rugose.....var. *reticulata* Kerremans.
  AA. Foveæ of thorax and elytra golden.
    B. Entirely bronze; base of abdominal segments metallic purple.....var. *klugi* J. Thomson.
    BB. Below golden green; elytra castaneous.....var. *mephisto* J. Thomson.
  AAA. Fovea of elytra red.....var. *vandykei*, subsp. nov.
II. Impressions of elytra absent.....var. *immaculata* Kerremans.

**S. interrupta** Olivier. Thorax entirely covered with irregular pits, smaller towards the middle and filled with white pubescence; beneath sombre bronze, above black, elytra black or sombre castaneous, more smoothly punctured. Elytra with 2 vittae at base on each side filled with white pilosity, the inner one small and short, the outer one long and broader and another on the elytral fold beneath the humeral umbone; posterior half of elytra with long vitta on each side filled with whitish pilosity, this vitta often broken up. Beneath rugose, entirely covered with the same white pubescence, except the median line where the pubescence is scanty or lacking altogether. Length: 27–42 mm. Width: 10–15 mm. Habitat: Damaraland; Senegal; Zambesi; Dakar.

Var. **reticulata** Kerremans. Entirely sombre bronze, metallic, with the elytra very strongly reticulate. Length: 26–35 mm. Width: 10–13.5 mm. Habitat: Senegal; Guinee.

Var. **klugi** Thompson. Fovea of thorax and elytra golden; entirely bronze; base of abdominal segments metallic purple. Length: 34 mm. Width: 13 mm. Habitat: White Nile; Senegal.

Var. **mephisto** Thomson. Fovea of thorax and elytra golden; Beneath golden green, shining; elytra castaneous.

Habitat: White Nile; Senegal; Benue; Niger.

Var. **vandykei** subsp. nov. The form, size, and punctuation are as in *S. interrupta* Olivier but the colouring is radically different from that of other varieties. Head and thorax the same as *interrupta*. Differs by having all the elytral impressions filled with red pilosity including the one below the humeral umbone; also by having a row of semi-triangular red spots on each side of the abdominal segments, those on the fourth and fifth segments largest, that on fifth running from top to bottom and from margin inwards from each side for 1 3 the width of the segment; segment 4 also has 2 extremely small more rounded spots in centre, not spaced evenly; the pilosity being otherwise normal and white. This variety is remarkable in that both red and white pilosity is present and the hairs of each colour are equally dense on the ventral surface of the abdomen. Length: 36 mm. Width: 14½ mm. Habitat: Bafulabe (Senegal). One specimen. Type in my collection.

Taken by W. F. Blakeslee. The specimen was sent to me loose and as a result it has lost 2 3 5 tarsi and 1 joint of an antenna. I take great pleasure in naming this after my friend and former teacher, Dr. Edwin C. Van Dyke of Berkeley, California.

Var. **immaculata** Kerremans. Impressions of elytra absent.

*Stevensii* and its one good variety may be separated as follows:

A. Thorax black; elytra castaneous.....*S. stevensii* Waterhouse.

AA. Thorax brassy; elytra very dark brown, with blue reflections.....var. *waterhousei*, subsp. nov.

**S. stevensii** Waterhouse. For description of this and its variety I will quote Mr. Waterhouse in toto. "Resembles and is closely allied with *S. interrupta*, but it differs in the sculpture and ornamentation of the abdomen. Head and thorax black, with numerous moderately strong punctures and a median impressed line, all filled with whitish pubescence, as in *interrupta*. Each elytron with a small dirty white spot near the scutellum, an elongate spot in the middle of the base, a longer one below the shoulder, and a line behind the middle (near the side). Body beneath dark aeneous. Abdomen marked with punctures, each puncture bearing an obscurely brassy hair. These punctures are placed in

groups of 2 or 3 or in undulating lines at the sides of the segments. On the 3rd and 4th segments these punctures are crowded together so as to form an undulating band, leaving a smooth shining spot on each side at the base, and a wide, triangular, sparingly punctured area in the middle. Punctures in the apical segment crowded together so as to form triangular patches on each side, leaving the middle space sparingly punctured." Length: 35 mm. Width: 13 mm. Habitat: West Africa; N. Nigeria.

Var. **waterhousei** subsp. nov. "Thorax brassy. Elytra very dark brown, with blue reflections." Habitat: Damaraland. Mr. C. O. Waterhouse in Ann. Mag. Nat. Hist. No. 82, p. 248 gave this variety without a name, and I have taken the liberty of affixing one to it, the characters given seeming sufficient to warrant it.

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## A GROUP OF AMERICAN HALICTINE BEES SIMULATING THE OLD-WORLD GENUS NOMIOIDES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

The gaily-marked little Halictine bees of the genus *Nomioides* are widely distributed over the Old World, even extending to Australia (*N. perditellus* Ckll.). They are extraordinarily like our American species of *Perdita*, but structurally are so distinct that we can hardly suppose that there is any particular affinity. More recently, however, there has been found in South America a group of *Nomioides*-like insects which might almost be referred to the Old World genus, did they not possess a sharply pointed marginal cell as in *Halictus*. This affords another instance of similarity between neotropical and Old World insects, which may be due to common descent or to "convergent evolution," or to both. The group referred to, with ten described species, has been found in the Andean region, but it now appears that it extends northward to Panama. The following new species has been collected by Mr. Busck.

### Halictus xanthinus, n. sp.

♀.—Length 5 mm. or a little over; head and thorax brilliant emerald green; mandibles pale yellow; clypeus ferruginous in middle and dusky reddish apically, but above and at sides green;

sides of face shining; inner orbits concave but not abruptly emarginate; scape long, black; flagellum dark above and ferruginous beneath; mesothorax dull and granular, with fine, very short, pale pruinose pubescence; tubercles yellow; tegulæ light fulvous; wings hyaline, nervures fuscous, outer nervures not weakened; first recurrent nervure joining extreme apex of second submarginal cell; area of metathorax large, microscopically reticulate, not plicate; legs pale yellowish or fulvous, the middle and hind tibiæ and tarsi fuscous, the middle tibiæ pale in front; hind spur with three very long spines; abdomen broad, smooth and shining, reddish fuscous and fulvous marked with lemon yellow; first segment broadly yellow basally and at sides except apically, where it is dark brown, but otherwise the segment is pale fulvous; second and third segments with a broad, yellow basal band, widest sublaterally, the segments otherwise fulvous in middle and dark brown laterally; fourth and fifth segments reddish-fuscous, with basal yellow bands; venter pale yellow, with the last three segments fuscous.

Porto Bello, Panama, March 13, 1911. (*Aug. Busck*), U. S. Nat. Museum. Nearest to the Brazilian *H. callichroma* (Ckll.), but with entire yellow bands on abdomen. The structure of the metathoracic enclosure is quite the same, with fine reticulations, the lines mostly transverse. Of the other species of the group, I possess *H. ephelix* Vach., from Marcapata, Peru; *H. phacodes* Vach., from Mapiri, Bolivia; and a cotype of *H. maculiventris* (Crawford), described under *Augochlora*. Crawford's species seems doubtfully distinct from *H. trinax* Vach., but I have no authentic material of the latter. Crawford and I, describing species of this group, have referred them to *Augochlora*. Vachal referred all the species to *Halictus*, but he included *Augochlora* in *Halictus*. Schrottky in 1910 placed the species in his genus *Nescorynura*. They are certainly not genuine *Augochlora*, nor do they agree well with typical *Nescorynura* or *Halictus*. They may be considered a distinct subgenus of *Halictus*, or even a separate genus. I do not propose a name, because it is possible that *Ctenocarynura* Schrottky (Deutsch. Ent. Zeit., 1914) is applicable. I have not been able to procure Schrottky's description, and there is no reference to the genus in the Zoological Record.

## RECENT CANADIAN PUBLICATIONS.

Under this heading we propose to present notices from time to time of entomological publications by writers residing in Canada, or such as appear in Canadian periodicals, whether by Canadians or not. Exceptions will be made in the case of papers published in the Annual Reports of the Entomological Society of Ontario and the present journal. Short articles or those of a popular character will, as a rule, be merely listed.

Authors will greatly assist the Editor by sending him copies of their publications for notice in this section.

The following papers were all published during the present year:

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF NOVA SCOTIA FOR 1917. No. 3. Truro, January, 1918. Pp. 1–96.

This excellent report gives ample evidence of the vigorous condition of the youngest branch of our Society, and is a most creditable production. It contains no less than sixteen papers by ten contributors, dealing with a variety of subjects, both economic and faunistic, and these are illustrated by 15 plates, most of them half-tones of fine quality.

The following papers are mainly of economic interest:

*Work of the Dominion Entomological Laboratory in Nova Scotia.* By G. E. Sanders. An outline of the results of experiments testing the effects of different combinations of insecticides and fungicides in apple spraying.

*Notes on the Yellow Leaf Hopper of the Birch* (*Oncopsis sobrius Walk.*). By W. H. Brittain. The life-history is given in detail and is illustrated by two plates, showing all the stages, and the hymenopterous parasite, *Polynema striaticorne* Gir.

*Miscellaneous Notes on the Apple Maggot.* By. W. H. Brittain.

*The Zebra Caterpillar.* By H. G. Payne.

*The Fall Cankerworm.* By H. G. Payne.

*The Rusty Tussock Moth.* By H. G. Payne.

*The White-marked Tussock Moth.* By H. G. Payne.

Detailed life-histories of these four species are given, based on original data. They are illustrated by 5 excellent photographic plates.

*Empoasca unicolor as an Apple Pest.* By W. H. Brittain and L. G. Saunders. Discusses the injuries caused by this insect, its life-history and methods of control. One plate.

*Introduction of the Parasites of the Brown Tail and Gipsy Moths into Canada.* By L. S. McLaine. A concise account of the methods employed in collecting and rearing the three important natural enemies of the Brown Tail and Gipsy Moths, viz., *Apanteles lacteicolor*, *Compsilura concinnata* and *Calosoma sycophanta*, and their introduction and liberation into the infested parts of New Brunswick and Nova Scotia

*The Dropping of Apples Caused by Spraying with Lime-Sulphur.* By G. E. Sanders and A. Kelsall. A valuable paper, discussing the available data on this problem, including original investigations on the factors which influence lime-sulphur injury in Nova Scotia.

*Notes on the Biology of Lygus pratensis in Nova Scotia.* By W. H. Brittain and L. G. Saunders. Discusses the life-history of this injurious insect, its food habits at different periods of the life cycle, oviposition, injuries, etc.

The papers dealing with general and faunistic subjects are as follows:

*The Tree Hoppers of Nova Scotia.* By W. H. Brittain. This paper and the following one are part of a useful series of articles on the insects of Nova Scotia, designed to make their identification easier for the general student. Keys to the genera and species are given and descriptive notes on the latter. The life-history of *Publilia concava*, not previously known, is given in detail. Twelve species are listed and are illustrated in 5 plates.

*The Locustidæ of Nova Scotia.* By C. B. Gooderham. Contains keys to the subfamilies, genera and species. Six species are recorded, all of which are described and five of them illustrated in detail.

*Some Reasons for Studying Pupæ.* By Edna Mosher. A suggestive paper, showing the need of more careful study of pupæ from various points of view, economic, taxonomic and morphological.

*Some Notes on the Crambinæ of Nova Scotia.* By E. Chesley Allen. An annotated list of 21 species of these moths.

*Spiders Collected in Nova Scotia and New Brunswick by Robt. Matheson in 1912.* By J. H. Emerton. Seventy-two species are listed.

Publications of the Entomological Branch, Dominion Department of Agriculture.

In the effort towards increasing food production the Entomological Branch is doing valuable national service. In connection with this work a series of circulars or "Crop Protection Leaflets" were issued and distributed during the early part of the year to be of timely value to growers during the present season. These leaflets dealt with the most approved methods of controlling the more serious insect pests, and are all appropriately illustrated.

Those published during 1918 are as follows:

No. 3. *Cutworms and Their Control.* By Arthur Gibson.
" 4. *Root Maggots and Their Control.* By Arthur Gibson.
" 5. *Prevent White Grub Injury.* By Arthur Gibson.
" 6. *How to Control Locusts or Grasshoppers.* By Arthur Gibson.
No. 7. *Rats and Mice.* By C. Gordon Hewitt.
" 8. *Aphids or Plant Lice.* By Wm. A. Ross.
" 9. *The Pea Weevil.* By Arthur Gibson.
" 10. *Arsenate of Lime.* By George E. Sanders.

The following articles by members of the staff of the Entomological Branch have appeared in the pages of the Agricultural Gazette, vol. 5, 1918.

*The Black Cherry Aphis.* By Wm. A. Ross (No. 1, pp. 13–16). Describes the history, habits and depredations, and the life-history of this pest. Illustrated from four photographs.

*Some Results of Scientific Research on Insect Pests in Canada.* By C. Gordon Hewitt, D. Sc. (No. 2, pp. 128–132). A brief exposition of the value of entomological research to agriculture and forestry as illustrated by some of the more striking results of the work of the Dominion Department of Agriculture.

*The Alfalfa Looper, Autographa californica* Speyer. By Arthur Gibson. (No. 2, pp. 132–136). This insect, which is widely distributed in Western North America, has been known as a pest in Canada only since 1914, when an outbreak occurred in British

Columbia. The habits, life-history, crops attacked, natural enemies and methods of control are described.

*The Predacious Mite, Hemisarcoptes Malus Shiner and its Relation to the Natural Control of the Oyster-shell Scale.* By John D. Tothill. (No. 3, pp. 234-239, 3 figs.). This mite, which feeds on the eggs and sometimes the later stages of the oyster-shell scale is believed to be the most important single factor in the natural control of the scale in Eastern Canada. It has not been found in British Columbia.

*Some Ladybird Beetles Destructive to Plant Lice.* By Wm. A. Ross. (No. 4, pp. 344–347, 2 figs.). This paper contains brief descriptions and notes on the habits of the eight species of ladybird beetles which are most important in the natural control of aphids on the Niagara Peninsula. Experiments were made to determine the egg-producing capacity of each species, the duration of the various stages and the feeding capacity of the adults as measured by the number of aphids consumed in a given time.

*The Habits and Control of White Grubs in Manitoba.* By Norman Criddle. (No. 5, pp. 449–454). Mr. Criddle has made a careful study of the four species of *Lachnosterna* found in Manitoba (*L. anxia, nitida, drakei* and *rugosa*). He describes the general life-history of these beetles and the peculiarities of the habits and habitat of each species. He recommends ploughing between May 14 and July 1 at an average depth of 5 inches, this being a time when none of the stages are below plough line and when the largest number of all stages will be turned up, the majorlty being then usually picked up by birds.

He also discusses thoroughly the natural control of these insects and the crops most suitable for sowing on infested lands.

*Some Blood-sucking Flies of Saskatchewan.* By A. E. Cameron. (No. 6, pp. 556–561, 6 figs). An interesting general account of the more troublesome mosquitoes, black flies and horse flies of the Saskatoon district.

*The Control of Insects in Ships by Steam.* By R. C. Treherne. (No. 7, pp. 668–669). Describes an instance where a vessel infested with the rice weevil (*Calandra oryzæ*) was freed from infestation by subjecting the hold to a high pressure of steam, after failure by an all-night fumigation with sulphur.

*Some Notes on the Natural Control of the Cherry-tree Ugly Nest Tortricid, Archips cerasivorana* Fitch. By A. B. Baird. (No. 8, pp. 766–771).

The action of the various parasites and other controlling factors is considered for each of the principal periods in the life-history, and their effectiveness is calculated on a percentage basis.

Other publications by the staff of the Entomological Branch are the following:

*The White-marked Tussock Moth and its Control on Shade Trees and Orchard Trees.* By J. M. Swaine and G. E. Sanders. Circular No. 11, March 7, 1918, 12 pp., 2 plates. This paper is divided into two parts. The first, entitled "The White-Marked Tussock Moth (*Hemerocampa leucostigma* S. & A.)" (pp. 1–11), by Mr. Swaine, gives descriptions of the various stages, the life-history, habits, kinds of trees attacked and the natural and artificial means of control. The second part, "The White-marked Tussock Moth as an Orchard Pest," (pp. 11, 12), by Mr. Sanders, describes the injuries done to fruit, and the spraying methods recommended for its control in orchards.

*The Pear Thrips (Tæniothrips inconsequens Uzel) and its Control in British Columbia.* By A. E. Cameron and R. C. Treherne Bull. No. 15, Entomological Branch, Dept. of Agriculture. May 8, 1918, 51 pp., 22 figs.

In this bulletin are set forth the results of a most careful and detailed investigation, extending over two years, of an insect, which has for many years been causing very serious injury to orchards on Vancouver Island, though known only since 1915 as the cause of this damage.

The chief injury consists in a "blighting" of the blossom buds in early spring, due to the entrance of the hibernated adults which feed upon the young delicate tissues within, and also to the later attacks of the larvæ, which hatch from eggs deposited in the petioles and midribs of the leaves, and the calyces and stems of the young fruit. The larvæ attack not only the blossoms and leaves but also the young fruit, causing a "russetting" of the skin known as "thrips scab." When mature the larvæ fall to the ground and, penetrating the soil, pass through the remaining stages, the

prepupal and pupal periods under ground, changing to adults late in the autumn and emerging early the following spring.

Although most destructive to pears, plums and prunes, the pear thrips readily attacks other fruit trees such as apples and cherries, besides many other trees and shrubs, the broad-leaved maple being one of the worst sufferers of all. It is not a native insect and is as yet unknown in Canada outside of Vancouver Island, though it has been reported from several localities in both Eastern and Western United States as well as from Europe.

The question of controlling this pest is thoroughly considered, and the authors state confidently that it can be readily held in check. Spraying is the only satisfactory method and may be applied twice or three times, according to the severity of the infestation, two sprayings in either case being made before blossoming, as treatment against the adults is more important than that directed against the larvæ. Miscible oil No. 2 in combination with nicotine sulphate gave best results for the first spray, while whale oil soap also with nicotine sulphate is most suitable and economical for the second and third sprays.

The bulletin is admirably illustrated with photographs and drawings by Dr. Cameron.

*Life-history of the Leaf-eating Crane-fly, Cylindrotoma splendens Doane.* By Alfred E. Cameron, M.A., D. Sc., F.E.S., Ann. Ent. Soc. Am., XI, No. 1, 1918, pp. 67–87, 18 figs.

This is an important contribution to the biology of crane-flies, as the species described is a member of a particularly interesting and isolated tribe of Tipulidæ, the Cylindrotomini, the known larvæ of which live exposed upon the leaves of various terrestrial and aquatic plants, instead of living in the mud of streams or in rotten wood as is the case with most of the family.

The discovery by Dr. Cameron of the larvæ of this species feeding on the leaves of the false bugbane (*Trautvetteria grandis*) on Vancouver Island is the first finding of the immature stages of *Cylindrotoma* in America, the only other nearctic species of the tribe, whose larva is known, being *Liogma nodicornis*. The other four species with known larvæ are all palæarctic and belong to as many genera, one of which is also a *Cylindrotoma*.

The writer succeeded in obtaining eggs from reared parents which mated in the rearing cages, and from these larvæ were obtained and successfully brought to maturity. More than 100 adults in all were reared.

In addition to careful observations on the behaviour in copulation, mechanism of oviposition, duration of immature stages, larval habits, etc., detailed descriptions are given of the larva and pupa, containing valuable information on the minute structures of the larval mouth capsule and other structural features. The figures illustrating these features are the work of the author and are admirable.

(To be continued.)

## ENTOMOLOGICAL SOCIETY OF ONTARIO.

The 55th Annual Meeting of the Society will be held at the Ontario Agricultural College, Guelph, Ontario, on Wednesday and Thursday, November 6th and 7th, 1918.

Members intending to present papers are requested to send in to the Secretary the titles (stating length of time required for reading and whether a lantern is desired) as soon as possible, in order that the programmes may be issued a week or more before the meeting. It is requested that papers do not exceed a twenty-minute time limit.

Accommodation for visitors can be secured in the men's residence at the College. Those intending to be present should send in their names to the Secretary on or before November 1st.

The Plant Pathologists of Canada have arranged to hold their Convention at the same place on Friday and Saturday, November 8th and 9th, immediately following the Entomological Society meeting.

L. CAESAR, President,
O. A. College,
Guelph, Ont.

A. W. BAKER, Secretary,
O. A. College,
Guelph, Ont.

October, 1918

Mailed October 10th, 1918

The Canadian Entomologist.

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# POPULAR AND PRACTICAL ENTOMOLOGY.

## INSECT TROPISMS.*

BY PROFESSOR A. WILLEY, MCGILL UNIVERSITY, MONTREAL.

The behaviour of insects, like that of other animals, is the result of the interaction between the organism and the medium or environment in which it lives. When properly understood it has the value but not always the precision of a chemical reaction, being the summation of a long series of physico-chemical changes.

The fundamental relation between organism and medium is determined by the necessity of the former to extract its nutriment from the latter. The medium not only furnishes food for the organism but also for its enemies and, in addition, it is the source of catastrophic danger. In order to procure its food the insect has to circumvent the enemies which persecute it and evade the dangers which threaten it. There are thousands of ways of avoiding or minimizing risk and thousands of species to adopt one or other of these ways. They all come under the head of "avoiding reactions," whether they operate as visible movements or attitudes, or as structural features; in the former case they may be called "global" reactions, in the latter they are cell or tissue reactions, *i. e.*, reactions of the idioplasm resulting in adaptive growth.

After the emergence from the egg the life-history of the holometabolous insects is broken up into two sharply marked periods of active struggle for existence. The larval activities are directed towards solving the problem of food and growth; those of the imago are concerned directly or indirectly with the problem of reproduction to which all the sense-organs are subordinated. A larva has only one question to answer: What can be eaten with impunity? For the imago the burning question of the day is: Where can the eggs be laid with safety? It is one of the tasks of the entomologist to ascertain how these elementary realities are

*Abstract of paper read at 54th Annual Meeting of the Entomological Society of Ontario, Nov. 9th, 1917.

faced, and that is the reason for studying insect behaviour. It is not enough for the imago to deposit its eggs upon the food-plant of its larva. The crisis of pupation has still to be passed. And all this is done, without reflection or premeditation, by hereditary predestination depending ultimately upon the specific physico-chemical properties which make up the "hereditary patrimony" of the organism.

The habits of the insects of to-day afford a picture, more or less altered by repetition and by circumstances, of the habits of their ancestors, so that their observation has an antiquarian or historical interest as well as an economic bearing, and it is not necessary to mix up these two aspects. It is one of the paradoxes of natural history that ancestral types can persist for untold ages alongside the more differentiated types. The tropical genus *Peripatus* is to the insect world what *Amphioxus* is to fishes. The latter has the English name of lancelet, and by a corresponding verbal transposition, *Peripatus* might perhaps become known as the "larvelet" since it has some of the properties and much of the appearance of an insect larva. Its habits are to this extent amphibious that whilst breathing air it requires an excess of moisture; hence, like the alpine salamander amongst batrachians, it is characteristically, though not invariably, viviparous. Whether oviparous or viviparous, there is no free larval period in the life-history of *Peripatus;* its trophic and reproductive phases are not separated.

The multudinous traits of insects may be grouped under two categories corresponding approximately with their larval and imaginal phases. Idiotropic tendencies comprise the feeding, resting and protective devices of individual life. Phylotropic tendencies comprise habits looking to the preservation of the race, *e. g.*, nest-building, egg-laying and brood-nursing. As an example of a casual observation of an idiotropic performance I may relate a small incident in my own experience. In December, 1905, I was descending the bund or high embankment of one of the ancient irrigation tanks of Ceylon when I noticed a dark brown Mantid ensconced amidst the green foliage of a low shrub. It happened to be a male of *Gongylus gongylodes*, a floreate species with foliaceous expansions on prothorax, legs and abdomen, known to Aldrovandus and figured by him in 1602.

As I approached it, several times in succession, on each occasion the insect squared the elbows of its fore limbs nearly at right angles to the body, the femur bent close against the long coxa, and the tibia pressed against the femur. This alert, defensive attitude had a terrifying aspect which was enhanced by a loud, rasping sound produced by rubbing the borders of the hind femora against the rim of the fore wings. The outer free border of each fore wing is thickened by a chitinous rim which is finely serrate. In the region of the hind femur the border of the wing is slightly emarginate, allowing free play to the thigh under ordinary circumstances. The femur itself is smooth, carrying a few minute hairs, but without any rough edge.

When the insect is alarmed, each hind femur is rubbed deliberately to and fro against the saw-like edge presented to it along the concave border of the wing, and a very effective stridulating sound results from the friction. The same sound can be closely reproduced upon the dead insect by gently passing a porcupine quill backwards and forwards along the wing-border. The serrate border of the wing is also present in the female *Gongylus*, where the emargination is still more pronounced.**

Quite recently I have become acquainted with a paper by J. Wood-Mason: *On the presence of a stridulating apparatus in certain Mantidæ*, (Trans. Ent. Soc. London, 1878, pp. 263-7) in which he, described the toothed edges of the tegmina of *Gongylus*, and supposed erroneously that the sound, which he had never heard, would be produced by the rubbing of the abdomen against the toothed edge. Professor Westwood asked Wood-Mason how it was that nobody had ever heard the Mantidæ stridulate, these insects being common enough where good observers have been. The answer was "that the species in which the stridulating apparatus is present are few in number;" and it may be added that they only perform under the right kind of stimulation applied at the right moment.

The homing instinct which we admire so much in bees and ants and wasps has been shown to depend to a surprising extent upon the chemical or olfactory sensitiveness of these insects, many

***Spolia Zeylanica*, vol. III, p. 226, Colombo, 1906.

of whose actions are reducible to chemotropic responses.*** The most trival movements may have the deepest significance for the individual, and, when repeated regularly under certain conditions, they have the value of tropistic reactions. It is well not to forget that the record of a vital act is less easy to couch in critical terms than is the description of an inert form. There are several factors which influence behaviour, such as the nature of the species, the susceptibility of the individual, the place and time of observation. If for any reason, known or unknown, the behaviour is indeterminate, we can do nothing with it and the result of observation is negative. Indeed the interaction of tropisms may so confuse the issue as to render observation nugatory. It is only under the fortunate train of circumstances which permits straight and clear-cut reactions, several times repeated, that the study of behaviour becomes available for synthetic treatment.

## NOTES ON NOVA SCOTIAN EUPTERYID LEAF-HOPPERS INCLUDING DESCRIPTIONS OF TWO NEW SPECIES.

BY W. L. MCATEE, WASHINGTON, D. C.

Professor W. H. Brittain, Provincial Entomologist of Nova Scotia, sent the writer a small collection of leaf-hoppers of this group, which is herewith reported upon, chiefly for the reason that characterization of two new species is required.

### List of Species.

*Dikraneura mali* Provancher.—Truro, August 26; Digby County.

*Empoasca atrolabes* Gillette.—Kentville, July 3; Annapolis, July 15.

*Empoasca obtusa* Walsh.—Kentville, August 14, 16; Annapolis Co., August 8, 11, 28.

*Empoasca unicolor* Gillette.—Annapolis Co., August 11.

**Typhlocyba cymba,** new species.—Head and thorax pale yellow flecked with pellucid greenish yellow; elsewhere pale yellowish

***N. E. McIndoo: *Recognition Among Insects*. Smithsonian Misc. Coll., vol. 68, No. 2, Washington, 1917.

hyaline. Scutellum and a straight-sided band just behind middle of, and confined to, clavi, fuscous. Margin of last ventral segment of female concave on each side before apex. Length 4.5 mm. One specimen, a female, Halifax, N. S., Sept. 1, 1917, in collection of Nova Scotia Department of Agriculture.

*Typhlocyba lethierryi* Edwards.—Truro, August 17.

*Typhlocyba rosæ* Linnæus.—Annapolis Co., August 5; Truro, August 26; Halifax, August 5, on elm; September 1, on maple.

*Typhlocyba ulmi* Linnæus.—Halifax, October 6.

**Erythroneura ador**, new species.—Venation nearly as in *E. obliqua* Say. Coloration unusual for an *Erythroneura* being pale yellow, except fore wings which vary to golden yellow, pale apically, and tips of tarsi which are dark. Length 4–4.5 mm. Described from four females (one the type) from Halifax, Nova Scotia, August 5, 1917, on elm, and one from same place September 1, 1917. Type and three paratypes in collection of Nova Scotia Department of Agriculture and one paratype in collection of writer.

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## TWO NEW DIPLOPODS FROM LOUISIANA.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

The two new species described below were found represented in a miscellaneous lot of myriapods sent to me for identification by Percy Viosca, Jr., of the Southern Biological Supply Co., of New Orleans. Other diplopods in the lot are *Callipus lactarius* (Say) and *Polydesmus serratus* (Say) also from Covington, *Parajulus* sp. and *Spirobolus marginatus* (Say) from New Orleans, and *Julus cærulocinctus* Wood from Rochester, N.Y. The chilopods consist of the following species: *Otocryptops sexspinosus* (Say), *Theatops posticus* (Say), and *Hemiscolopendra punctiventris* (Newport) from Covington, *Arenophilus bipuncticeps* (Wood) from New Orleans, *Neolithobius mordax* (Koch) from Lake Charles, and *Scolopendra viridis* Say from Florida.

### **Ethojulus amphelictus,** gen. et sp. nov.

This form is separated generically from *Parajulus* because of its different type of structure in the male gonopods. The

anterior gonopods, which are ectal in position, are deeply bifid; the anterior branch is of ordinary texture, clavate in outline and pilose; the posterior branch is strongly chitinized and smooth, rather slender and blade-like, curving first caudad and then ventrad and mesad, each presenting an acute spur from its mesal edge just distad of the middle of its length. The posterior gonopods are long, slender, chitinous blades curving forward, downward, caudad and then again dorsad, thus forming three-fourths of a circle, with the tip bent slightly to one side; from near the base arises a shorter, distally acute, blade which is weakly sigmoidally bent and which extends ventrad nearly to the lower segment of the principal branch.

Sides and venter light brown. Dorsum of pale ferruginous cast, dusky; a longitudinal mid-dorsal black line; a row of large black spots along each side over the pores; above each black spot a fulvous spot and between this and the mid-dorsal line a narrow, fulvous stripe and a stripe of similar colour also commonly showing across the anterior border of the somite. The sides above, especially in anterior region of body, with a network of black lines over the lighter background. The collum covered with a similar network, a solid dark, transverse band just caudad of the anterior border, this widening toward the middle; a similar but narrower band across the caudal border, this connected with the anterior one along the median line. Vertex of head also with a network of dark lines; a solid black band between edges, this including the usual light spots below. Antennæ blackish. Legs fulvous.

In the female the second tergite extends very much below the level of the collum; angularly pointed below. The collum with a longitudinal stria just above the margining sulcus on each side. In the male the collum is more elongate, as usual in Parajulus, with the lower margin long and straight. The second tergite does not extend below the level of the collum and its lower edge is straight.

The cardo of the mandibles in the male is strongly produced below; the process narrowed angularly ventrad, its apex narrowly rounded and reaching to the level of the lower edge of the labrum.

Segmental sutures strongly curved at level of pores.

Anal scutum exceeding the valves moderately, the tip straight and acute.

Number of segments, fifty-six and fifty-eight.

Diameter of female 3 mm.; of male 2.5 mm.

*Locality.*—Louisiana; Covington, Dec. 16, 1917.

**Fontaria louisiana,** sp. nov.

Type above dull brown; carinæ bright yellow.

Vestigial foveolæ 2+2.

Characterized by the structure of the gonopods of the male. In these the posterior or principal limb of the telopodite is bifid, the branches long, slender and subequal and cross those of the other gonopod; of the two branches or prongs the mesal one is geniculate near tip with the latter acute, while the ectal one is straight, its tip also acute. The proximal, undivided and less chitinous, stalk is thick, densely hairy, and is prolonged along the mesal side of the mesal prong. The anterior or lesser spine is much shorter than the bifid branch; it is much narrowed distad, is moderately sigmoidally flexed, and crosses that of the other gonopod.

The body is narrowed at both ends between which the sides are subparallel. The caudal plate short, truncate at tip. Processes of penultimate keels distally rounded, the other acute.

Length (male) 50 mm.

*Locality.*—Louisiana; Covington, Dec. 16, 1917.

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## A LONG-FASTING LEPIDOPTER.

BY R. R. ROWLEY, LOUISIANA, MO.

On May 15th, 1915, I received from Miss Harriet Boyes, of San Benito, Texas, twenty-four cocoons of *Rothschildia jorulla*, which she informed me were collected during the previous winter and spun by larvæ of the autumn of 1914.

The record for emergence of imagos is as follows: October 14th, 1915, one male moth; October 9th, 1916, one male; October

10th, 1916, one male; October 16th, 1916, one female; July 19th, 1917, one female; September 20th, 1917, one male; April 25th, 1918, one female; May 2nd, 1918, one male.

Two cocoons gave large wasp-like hymenopters, five contain dead chrysalids, three are doubtful, and six pupæ are still alive and will doubtless give imagos in the autumn, next spring and perhaps later.

Miss Boyes, as well as Miss Pattie Hutchinson, of Beeville, Texas, inform me they have had similar experiences with *jorulla* cocoons.

This coming autumn these cocoons will be four years old. Think of a macro-moth 4 years as a chrysalis!

I have had pupæ of *Automeris io* produce imagos on the second summer, of *Callosamia promethea* to do the same, and occasionally a few to live into the second winter, but have known only one butterfly to live two years as chrysalis, *Anthocharis genutia*.

Little danger of such insects becoming extinct, but four years between meals is a long time to go hungry.

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## ENTOMOLOGICAL SOCIETY OF ONTARIO.

### Notice of Postponement of Meeting.

Owing to the epidemic of influenza it has been thought wise to postpone the annual meeting of the Society, and to hold it on Wednesday and Thursday, the 4th and 5th of December, instead of the 6th and 7th of November.

The place of meeting will be, as previously announced, the Ontario Agricultural College, Guelph.

It is expected that accommodation for all members can be secured in the residence at the College. Members who propose being present will kindly notify the secretary in advance, and also send as soon as possible the titles of their papers.

The Plant pathologists will meet on the Friday immediately following the Entomological Society meeting.

L. Caesar, President, O. A. College, Guelph, Ont.
A. W. Baker, Secretary, O. A. College, Gueph, Ont.

November, 1918

# ON THE AMERICAN REPRESENTATIVES OF SOMATOCHLORA ARCTICA WITH DESCRIPTIONS OF TWO NEW SPECIES. (ODONATA).

BY E. M. WALKER, TORONTO.

Three North American species of Somatochlora have been described in which the appendages of the male are of the same general form as in the palæarctic species *S. arctica* Zetterst. These are *S. forcipata* Scudd., *S. semicircularis* Selys, and *S. franklini* Selys. Another species, *S. macrotona*, has been described by Williamson (Ent. News, XX, 1909, pp. 78-79) but, as mentioned below, I find this to be identical with *franklini*. To these three species I have two others to add, so that we have in North America five species of the *arctica* group. I had intended that the descriptions of these new species should first appear in a monograph of the American species of this genus, which is now in course of preparation, but at the request of another writer who wishes to list one of them I decided to publish them in advance.

The five North American species of Somatochlora of the *arctica* group may be separated as follows:

A. Superior appendages of ♂ with a prominent external tubercle beyond the middle, visible from above; vulvar lamina half as long as 9th sternite, bilobed; postclypeus wholly black.....*semicircularis* Selys.

AA. Distal external tubercle of superior appendages when present not or scarcely visible from above; vulvar lamina little or no shorter than the 9th sternite, entire; postclypeus variable.

B. Abdominal segments 5 to 7 with yellow latero-basal spots, greatest width of ♂ abdomen distal end of seg. 5, thence narrowing caudad.

C. Lateral thoracic spots brownish, scarcely paler than the ground colour, the mesepimeral elongate, ill defined; superior appendages of ♂ in profile straight, ventro-lateral tooth not affecting the outline; vulvar lamina extending almost or quite to the hind margin of 10th sternite.....*incurvata* n. sp.

CC. Lateral thoracic spots pale yellow, subovate, conspicuous; superior appendages of ♂ in profile arcuate, with a very prominent ventrolateral tooth, which affects the outline; vulvar lamina about as long as 9th sternite.....*forcipata* Scudd.

BB. Abdominal segments 5 to 7 without yellow spots, greatest width of ♂ abdomen at distal end of seg. 6 or beyond.

D. Frons bounded below by a yellowish margin, separating the metallic portion from postclypeus, the latter with yellowish lateral lobes; hind wing of ♂ but little shorter than abdomen (about 30:33), the anal triangle more or less yellow.....*kennedyi*, n. sp.

DD. Frons without a yellow inferior margin, the dark coloration continuous with that of postclypeus, which is wholly black; hind wing of ♂ decidedly shorter than abdomen (about 26:38), anal triangle with a brown spot.....*franklini* Selys.

**Somatochlora semicircularis** Selys.

This species seems to be wholly western, and is apparently the commonest species of the genus from the Rocky Mountains to the Pacific Coast. References to *semicircularis* from eastern localities (Williamson, Ent. News, April, 1906, p. 136, pl. V, figs. 2, 3, 4) apply to *S. kennedyi*.

*S. semicircularis* is easily recognized by the form of the male abdominal appendages and the vulvar lamina of the female, together with the black lateral lobes of the clypeus. The lateral thoracic spots are conspicuous in young individuals but of a deeper yellow than in *forcipata*, and the metepimeral spot is usually much smaller. Lateral abdominal spots are generally present but are variable and sometimes absent. The extent of these variations are well shown by Kennedy (Proc. U. S. Nat. Mus., 46, 1913, pp. 111–126, figs. 1–57). It is the stoutest of the five species of the group.

Material studied.—68 ♂'s, 21 ♀'s; Banff, Alta., June 29–31, 1913, 5 ♂'s 2 ♀'s, (Walker and Kurata); Nordegg, Alta., 6,500 ft., July 16, 1917, 1 ♂, (F. C. Whitehouse); Mt. Benson, Vancouver Is., B.C., July 21, 1909, 4 ♂'s 1 ♀; id., July 23, 1909, 1 ♀, (A. G. Huntsman); Departure Bay, Vanc. Is., July 13, 1908,

4 ♂'s 2 ♀'s, (Huntsman); near Lonely Lake, Vanc. Is., July 19, 1913, 6 ♂'s 2 ♀'s, (Walker and Kurata); Ainsworth, B.C., July 11, 1903, 1 ♂, (R. P. Currie, U.S.N.M.); Bumping Lake, Wash., July 10–11, 1911, 37 ♂'s 12 ♀'s, incl. 7 prs. in cop. (C. H. Kennedy, U.S.N.M.); Big Meadows, Or., July 7–8, 1913, 6 ♂'s, (Kennedy); Snake River, Yellowstone National Park, Aug. 14, 1896, 1 ♂, (Currie, U.S.N.M.); "Mountains, S. W. Colorado," Aug. 15–Sept. 6, 3 ♂'s 1 ♀ (Lieut. Carpenter, coll. Calvert, 1 ♂ coll. Walker).

**Somatochlora incurvata,** n. sp.

*Male.*—Occiput, frontal vesicle and upper part of frons metallic blue-black; sides of frons and lower margin ochreous to brownish yellow; postclypeus black in middle, lateral lobes castaneous; labrum black; anteclypeus and labium pale yellow; pile moderately dense, blackish on metallic areas, elsewhere pale brownish.

Prothorax dark greyish-brown, anterior lobe broadly edged with whitish, posterior lobe brownish ochreous. Meso- and metathorax metallic blue to violet, sometimes with greenish reflexions, with the following parts reddish brown; antealar sinus, inferior half of mesepisternum, an area along bases of wings extending as a stripe down the mesepimerum, an obscure, ill-defined area enclosing the metastigma and a large spot on the metepisternum, which is angular above when well defined. The mesepimeral and metepimeral spots are generally lighter than the other brown areas. Fore coxæ black in front, reddish brown behind, this colour extending over most of the outer surface of the fore femora. Pile of thorax rather thin, especially on the sides, pale brown.

Wings hyaline, the faint yellow tinge deepening in the anal triangles; pterostigmata castaneous, not very dark; costal veins dark brown, edged with dull ochreous toward the base; membranule dull dark brown, paler in basal third.

Abdomen slender, elongate, expanding from the constriction at seg. 3 to the distal end of seg. 5, narrowing gradually on 6, more rapidly on 7 and 8. Pile pale brownish, scanty. Genital lobes rather small, rounded angulate, incurved.

Colour greenish black, moderately shining. Segments 1, 2 and base of 3 castaneous, somewhat lighter on the sides and dorsal

surface of 2, but not forming distinct spots in the specimens studied. Base of 3 with lateral yellowish patch extending from dorsal to ventral surface. Segs. 4 to 8, each with a roundish, baso-lateral spot becoming small on 8.

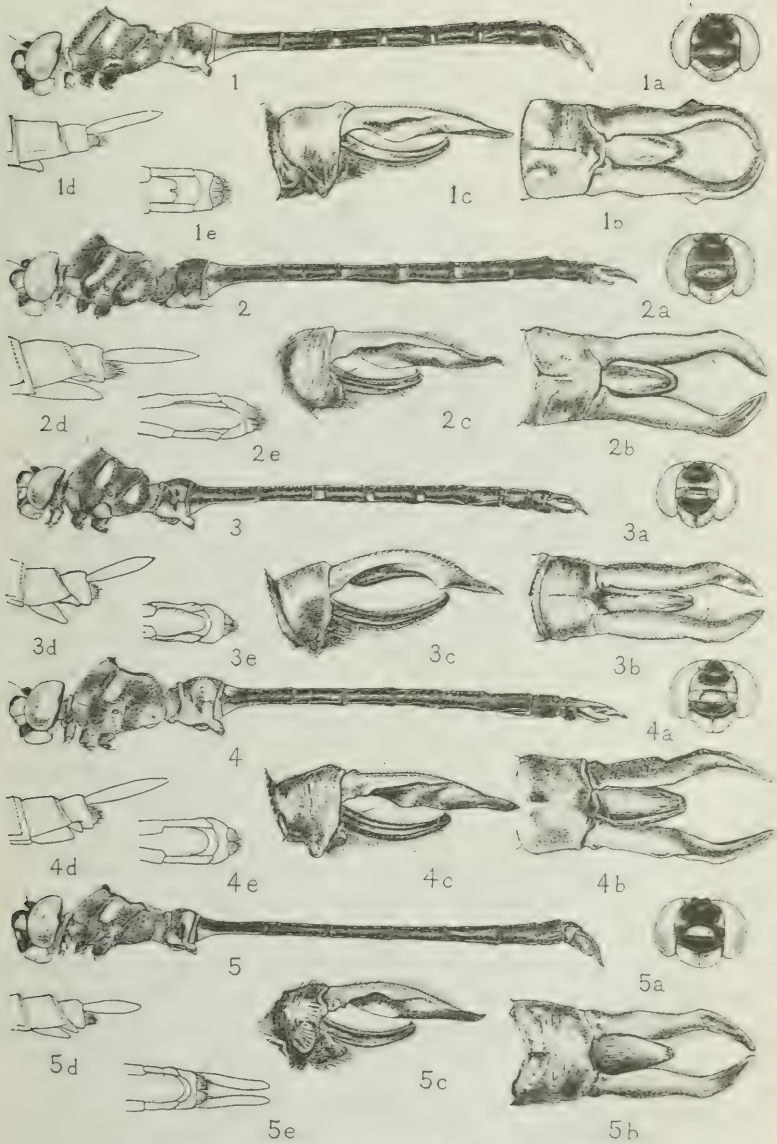
Appendages.—The form of these is shown on pl. X, figs. 2b, 2c. In dorsal view the superior appendages appear widest at the base, where they are close together, subparallel in proximal half, the apical inward curve nearly as in *semicircularis* but not quite so regularly arcuate. In profile they are straight, lateral carinæ percurrent, inferior carinæ gently arcuate towards base, slightly bent outward, but not visible from above; ventro-lateral prominence well marked, barely seen from above (probably not in all cases); apices acute, slightly carinate above, the extreme tips somewhat decurved (perhaps in drying). Inferior appendage about half as long as superiors, triangular, apex bluntly pointed, with a well-marked recurved spine.

*Female.*—Similar in coloration to male. Seg. 2 is entirely castaneous, except a very small lateral spot and an apical ring, which are pale brownish grey or drab. The underside of 3 is also of about the same colour. The yellow spots on the other abdominal segments are usually larger than in the ♂, and often diffusely prolonged caudad.

The wings as usual show considerable variation in colour but are typically hyaline, each with two basal, amber, yellow streaks, and a yellowish cloud occupying the distal half, or less, of the wing and deepest about the pterostigma. In some individuals the entire wing is flavescent, but even in these the basal streaks appear deeper than the rest of the wing.

In most of the specimens the abdomen is broadest at base and tapers fairly regularly to near the caudal extremity, but, as in other species, its form varies with age, younger individuals being more depressed and regularly tapering, older ones more cylindrical and laterally constricted at seg. 3.

The vulvar lamina is elongate, extending in all the specimens well beyond the distal margin of the 9th sternite, as far as that of 10 or even a little farther. It is horizontal, trough-shaped, the sides slightly convergent, apex broadly rounded, upper edges before the apical curve slightly arcuate. Inferior surface in profile




NORTH AMERICAN SPECIES OF SOMATOCHLORA OF THE *ARCTICA* GROUP.

feebly convex. Colour yellowish, darkened in the middle. Appendages about as long as vulvar lamina or as segs. 9 and 10 together.

VENATIONAL DETAILS. (2 ♂'s 10 ♀'s.)

| | No. of veins | No. of wings, ♂ | No. of wings, ♀ | | No. of veins | No. of wings ♂ | No. of wings ♀ |
|---|---|---|---|---|---|---|---|
| Antecubitals fore wings | 7<br>8<br>9 | <br>2<br>2 | 3 = 15%<br>16 = 80%<br>1 = 5% | 2nd postc. before pter., fore wings | 3<br>4 | 4<br>4 | 17 = 85%<br>3 = 15% |
| Antecubitals hind wings | 5<br>6 | 2<br>2 | 18 = 90%<br>2 = 10% | 2nd postc. before pter., hind wings | 3<br>4<br>5 | <br>4 | 4 = 20%<br>14 = 70<br>2 = 10% |
| Postcubitals fore wings | 5<br>6<br>7 | <br>4 | 6 = 30%<br>10 = 50%<br>4 = 20% | Veins in triangle, fore wings | 0<br>1 | <br>4 | 2 = 10%<br>18 = 90% |
| Postcubitals hind wings | 6<br>7<br>8<br>10 | <br>1<br>3 | 2 = 10%<br>12 = 60%<br>5 = 25%<br>1 = 5% | Veins in triangle, hind wings | 0<br>1 | <br>4 | 2 = 10%<br>18 = 90% |

*Measurements**.—(2 ♂'s, 10 ♀'s)—Length (without apps.) ♂ 52.0–54.5, ♀ 47.5–56.5; thorax, ♂ 8–9, ♀ 7.5–8.5; abdomen (without apps.), ♂ 38.0–39.5, ♀ 35.0–43.0; hind wing, ♂ 33.0–34.0, ♀ 32.0–36.5 ; sup. apps. ♂ 4 ; apps. ♀ 3.0–3.75; pterostigma of hind wing (costal margin), ♂ 2.75–3.0, ♀ 2.8–3.5; width of hind wing, ♂ 9.25–10.0, ♀ 9.0–10.3; width of head, ♂ 7.6–8.0, ♀ 7.0–8.0.

*Holotype*.—♂ Whitefish Pt., Chippewa Co., Mich., July 29, 1916 (A. F. Combs). *Allotype*.—♀, same data. Both in the University of Michigan Museum, Ann Arbor, Mich. *Paratopotypes*.—1 ♂ 2 ♀'s Aug. 7, 1916; 6 ♀'s July 29, 1916; 1 ♀ Aug. 4, 1916, 1 ♀ without date. Total 2 ♂'s 11 ♀'s.

This species is a very close relative of *S. forcipata*. Its average size is larger and the lateral thoracic spots differ in shape and colour, otherwise the colour pattern approaches that of *forcipata* closely. The superior appendages of the ♂ appear in profile more like those of *kennedyi* than *forcipata* and, as in the former the inferior appendage is only about half the length of the superiors. The vulvar lamina is decidedly longer than in any other species.

**Somatochlora forcipata** Scudder.

This slender, dark-coloured species is rather widely distributed but seems to be everywhere rare. It ranges from New-

*All measurements are in millimetres.

foundland and Labrador to Great Slave Lake and southward to Nova Scotia, northern New England, Quebec, Ontario and northern Michigan. I have seen but nine specimens from the following localities:

Hopedale, Labrador, Aug., 1917, 1 ♂, (W. W. Perrett) Ashwanipi River, Northern Quebec, July 25, 1917, 1 ♀, (Carnegie Museum Coll.); Isle d'Orleans, Que., Aug. 27, 1904, 1 ♂, (Walker); Algonquin Park, Ont., July 15, 1900, 1 ♂, (J. Macoun); De Grassi Pt., Ont., June 26, 1918, 1 ♂, (Walker); Profile Lake, N. H., July 20, 1918, 1 ♂, (R. H. Howe); Manistiqua River, Schoolcraft Co., Mich., 2 ♂'s, (A. F. Combs); Marquette, Mich., 1 ♀, (Coll. Hubbard & Schwarz, U. S. N. M.).

**Somatochlora kennedyi,** n. sp.

*Male.*—Occiput, frontal vesicle and upper part of frons metallic blue-black or green-black; sides of frons and a moderately broad, lower margin yellowish brown; postclypeus dark brown or black in centre, lateral lobes yellow; labrum black or deep brown, anteclypeus and labium pale yellow. Pile somewhat dense, blackish on top of head, pale yellowish on face. Rear of head black with whitish pile.

Prothorax greyish brown, anterior lobe edged with whitish, posterior lobe testaceous. Meso- and metathorax metallic gold-green with blue reflexions, the actual brilliancy of the colour much obscured by dense, light brownish pile; the following parts ochreous but not forming well-defined nor conspicuous spots:—the antealar sinus, the ventral edges of the mesepisternum, a narrow area below bases of wings, an oblong or ovate spot on the mesepimerum connected with the above area, an ill-defined blotch enclosing the metastigma, and the posterior half or more of the metepimerum. Fore coxæ black in front, dull yellowish above and behind, this colour extending over trochanters to outer surface of fore femora in their basal half.

Wings hyaline or tinged with yellow, especially along costa, sometimes entirely suffused with amber yellow; costa yellowish proximally, darkening beyond nodus; pterostigmata dark yellowish brown; hind wings with a yellow basal spot of variable size and

depth of colour, but not extending much beyond the anal triangle; membranule dark smoky brown, the basal third or fourth paler.

Abdomen greatly constricted at seg. 3, slender and scarcely expanding on 4, thence gradually widening to the distal end of 6 or even that of 7, beyond which it is considerably narrowed again. Pile pale brownish, long and thick on segs. 1 and 2, elsewhere very short. Genital lobes large, subangulate below, moderately incurved, with dense pile.

Colour greenish black, but little shining, marked with dull yellow as follows: Seg. 1, a large lateral spot. Seg. 2, a large antero-ventral and usually a postero-ventral spot on each side, narrowly separate or connected, the latter extending upon bases of auricles; a pair of large, rounded postero-dorsal spots, which may be narrowly connected with the postero-ventral spot, and a pale, apical annulus. Seg. 3, a pair of small, antero-dorsal spots and larger paler antero-ventral spots, continued caudad as narrow marginal streaks. The remaining segments have no pale markings except the brownish streaks along the tergal margins on the ventral surface.

The abdominal appendages (pl. X, figs. 4b, 4c) differ from those *forcipata* as follows: The superior appendages are less arched in profile with a less prominent distal ventro-lateral prominence; the lateral carina extends farther distad and gives a broken appearance to the outer margin in dorsal view, the apices are more acute. The inferior appendage is a little shorter. The broken outer margin and acute apices also distinguish the appendages from those of *incurvata* and *semicircularis*, the latter differing also in other points already noted.

*Female.*—Similar to male in coloration with the following slight differences: Abdominal segment 2 with a single large pair of ventro-lateral spots and a pair of postero-dorsals, or these may fuse to form one large lateral blotch. Seg. 3 with antero-dorsal spots much larger and broadly connected with the antero-ventral spots. The basal yellow spot of the hind wings may be very small or indistinct.

The shape of the abdomen varies much according to age, and is similar to that of *incurvata*. Vulvar lamina about four-fifths as long as 9th sternite, not elevated, spoon-shaped, broadest at

base, but little narrowed distad, the free margin entire, broadly rounded, colour yellowish.

VENATIONAL DETAILS. (10 ♂'s 10 ♀'s.)

| | No. of veins | No. of wings, ♂ | No. of wings, ♀ | | No. of veins | No. of wings, ♂ | No. of wings, ♀ |
|---|---|---|---|---|---|---|---|
| Antecubitals, fore wings. | 7 | 11 =55% | 11 =55% | Antecubitals hind wings. | 4 | 1 =5 % | |
| | 8 | 9 =45% | 8 =40% | | 5 | 17 =85% | 19 =95% |
| | 9 | | 1 =5 % | | 6 | 1 =5 % | 1 = 5% |
| | | | | | 7 | | |
| | | | | | 8 | 1 = 5% | |
| Postcubitals, fore wings. | 5 | | 6 =30% | Postcubitals, hind wings. | 5 | 1 = 5% | 2 =10% |
| | 6 | 12 =60% | 6 =30% | | 6 | 1 = 5% | 2 =10% |
| | 7 | 4 =20% | 8 =40% | | 7 | 8 =40% | 12 =60% |
| | 8 | 4 =20% | | | 8 | 7 =35% | 3 =15% |
| | | | | | 9 | 2 =10% | |
| | | | | | 10 | 1 = 5% | 1 = 5% |
| Triangles fore wings | 0 | | | Triangle hind wings | 0 | 7 =35% | 4 =20% |
| | 1 | 20 =100% | 20 =100% | | 1 | 13 =65% | 15 =75% |
| | 2 | | | | 2 | | 1 = 5% |

*Measurements.*—10 ♂'s 10 ♀'s. Length (without apps.) ♂ 46.5–51.0, ♀ 46.0–52.0; thorax, ♂ 8.5–9.0, ♀ 7.0–8.0; abdomen (without apps.), ♂ 33–36, ♀ 34–38.5; hind wing, ♂ 30–31.5, ♀ 30–32.5 ; sup. apps. ♂ 3.6–4; apps. ♀ 3.4–4.3 ; pterostigma of hind wing, ♂ 2.5–3, ♀ 2.5–3; width of hind wing, ♂ 8.5–9, ♀ 9–10; width of head, ♂ 7–7.5, ♀ 7.25–7.6.

*Holotype.*—♂, Orono, Me., F. L. Harvey, collection of Dr. P. P. Calvert. *Allotype.*—♀, Orono, Me., F. L. Harvey, collection of Dr. P. P. Calvert ; taken in cop. with holotype. *Paratopotype.*—♂, June 15, 1891, Harvey, collection of Dr. Calvert.

I have also examined the following specimens: Orono, Me., June 18, 1898, Bartle Harvey, 1 ♀, (U. S. Nat. Mus.); Manchester, Me., Miss M. Wadsworth, June 20, 1904, 1 ♀, (coll. Calvert); Concord, Mass., R. H. Howe, June 18, 1917, 1 ♀, (teneral); id., June 24, 1917, 2 ♂'s 1 ♀ ; id., June 4, 1917, 1 ♀ ; id., June 4, 1918, 1 ♂ 1 ♀ ; id., June 6, 1918, 1 ♂ 1 ♀ ; id., June 9, 1918, 1 ♂; Manistiqua River, Schoolcraft Co., Mich., 2 ♂'s, (A. F. Combs); Godbout River, Quebec, July 29, 1918, 1 ♂ 1 ♀, (Walker); Mer Bleue, near Ottawa, Ont., June 9, 1903, 2 ♂'s 2 ♀'s, (A. Gibson); De Grassi Pt., Lake Simcoe, Ont., June 19, 1917, 1 ♂, (Walker). Total 13 ♂'s, 11 ♀'s.

This species has been confused with both *forcipata* and *semicircularis*. Eastern records of this latter species all belong to

*kennedyi*. The untangling of the synonymy, however, can be omitted here, as it will be considered in my revision of the genus, now in preparation.

I take pleasure in naming this species after Mr. Clarence Hamilton Kennedy in recognition of his valuable contributions to North American Odonatology. Mr. Kennedy recognized this species as distinct independently of the writer and at about the same time, so that it is particularly fitting that it should bear his name.

**Somatochlora franklini** Selys.

This species is remarkable for the great length and slenderness of the abdomen and shortness of the wings in the male, and to a less extent in the female. There is much variation in these characters, and also in size, coloration of wings and length of appendages of the ♀.

A study of this species in considerable series shows that *S. macrotona* Wmsn. (Ent. News, Feb., '09, pp. 78–79) is not distinct from *franklini*, the characters employed to separate the two forms being very variable, especially in the female. The principal character upon which the specific diagnosis of *macrotona* was based is the presence of small genital lobes in the ♀, these being absent in *franklini*. I find these lobes are sometimes present as an individual variation, but are independent of the other characters given for *macrotona*. They show various degrees of development, being sometimes barely indicated.

There is some doubt as to whether the present species is the true *franklini* of Selys. In case it proves to be a distinct species, the name *macrotona* will still be valid.

*S. franklini* is the most widely distributed species of this group, and is characteristic of the Hudsonian and Canadian zones from Labrador, Newfoundland and Maine to the Rocky Mountains, probably ranging to the Pacific Coast.

I have examined the following material: Hopedale, Labrador, Aug., 1917, 1 ♀, (W. W. Perrett); East Main, Hudson Bay, Que., July 8, 1914, 2 ♀'s, (W. Todd); Sherbrooke, Que., 1 ♀, (Abbè Begin); Mer Bleue, near Ottawa, Ont., June 9, 1908, 1 ♂, (A. Gibson); Western Ont., Hudson Bay drainage, July 21, 1917, (Mrs. G. K. Jennings), 1 ♀; Winnipeg, Man., June 16, 1910,

1 ♂ 1 ♀, (J. B. Wallis); Winnipeg Beach, Man., June 19, 1909, 1 ♀, (Wallis); Husavick, Man., Aug. 17, 1910, 1 ♀, (Wallis); Le Pas, Man., July 1, 1917, 1 ♂ 2 ♀'s, (Wallis); Hudson Bay Railway, various points from M214 to M332, July 7–19, 1917, 4 ♂'s 7 ♀'s, (Wallis); Nordegg, Alta., July 11–17, 1917, 5 ♂'s 17 ♀'s, (F. C. Whitehouse); Chemo Stream, Bradley, Me., July 27, 1891, 1 ♂, (F. L. Harvey); Whitefish Point, Chippewa Co., Mich., Aug. 4, 1916, 1 ♂; id., no date, 2 ♂'s, (A. F. Combs). Total 16 ♂'s, 34 ♀'s.

## Explanation of Plate X.

Fig. 1—*Somatochlora semicircularis* Selys, ♂ (legs and wings omitted); 1a, front view of head; 2b, abdominal appendages of ♂, dorsal view; 1c, same, lateral view; 1d, end segments of ♀, lateral view; 1e, same, ventral view (appendages omitted).

Figs. 2—2e, *Somatochlora incurvata*, n. sp., same parts in fig. 1-1e.

Figs. 3—3e, *Somatochlora forcipata* Scudd., same parts as in figs. 1-1e.

Figs. 4—4e, *Somatochlora kennedyi*, n. sp., same parts as in figs. 1-1e.

Figs. 5—5e, *Somatochlora franklini* Selys, same parts as in figs. 1-1e.

## ZOROTYPUS HUBBARDI, A NEW SPECIES OF THE ORDER ZORAPTERA FROM THE UNITED STATES.

BY A. N. CAUDELL, BUREAU OF ENTOMOLOGY, U. S. DEPT. OF AGRICULTURE, WASHINGTON, D.C.

For over two decades a very unusual termitophilous inquiline has remained unstudied in the National Collection in spite of its having been several times brought to the attention of men better fitted to publish upon it than myself. It seems wrong to neglect longer the recording of this interesting addition to our fauna, and especially the interesting notes made by Mr. H. G. Hubbard, the original discoverer of the species, and I have, therefore, decided to assume the responsibility for the new name here erected. In

my studies I have benefited greatly from advice and assistance from various of my office associates. At an opportune moment, just as I was studying the Hubbard material, there came to hand an additional lot of six specimens taken but a month previous by Mr. Snyder. This accession of fresh material proved of great value.

It was in 1895 that this insect was first discovered, Mr. Hubbard collecting material at Haw Creek, Florida, in March of that year. Specimens were taken in termite galleries in a decayed log, and field notes were made on their appearance and habits. Except for an extract published by T. E. Snyder, Bull. Bur. Ent., U. S. Dept. Agric., No. 94, part II, p. 71 (1915), these notes are still in manuscript. Deeming them well worth printing I here quote them in full:

"Termitophilous insects Haw Creek, Fla., March 4, 1895, (*Trichopsenus?* and a Thysanuran near *Campodea* imitating a young termite) found in galleries of *Termes flavipes*, small var., living in large, red rotten log in palmetto hammock. The *Campodea* lives in galleries not among the termites but in their immediate vicinity. It can only be distinguished from the immature termite by its longer legs and greater activity. It is very difficult to capture. I saw several, got only one in small vial of alcohol.

"March 26 from same log I took numerous specimens of the Thysanuron, but lost one vial and saved only a few specimens, one of which is mounted on a point, the rest in alcohol tube.

"May 16. I mounted in balsam on a slide two specimens, one on its back and one on its belly. The balsam clouded considerably."

The *Trichopenus*? mentioned in the above quoted notes is a Staphylinid beetle.

Some time later, the exact date not known and of little importance, the above notes were rewritten by Mr. Hubbard in a more permanent form and show a change of opinion as to the probable identity of the species concerned. This recasted note is here copied in full:

"247 Termitophilous Psocid found with termites in large log in pine swampy hammock of Prairie Farm, Haw Creek, Fla.,

March 26, 1895. Several specimens in alcohol together with worker of the termite collected at the above date, also one specimen dry on triangle point, collected March 4, '95, from the same log. The resemblance to a young termite is perfect, especially in mature specimens like that mounted dry. The psocid is, however, much more active than the termite and very difficult to capture. Immature specimens were not rare, and I took a large number but lost most of them with the vial that contained them. The immature specimens inhabit the galleries of the termites, but are not so apt to be found among the termites themselves as in their immediate vicinity. No. 244 *Microcpytus testaceus* was taken from this log at the same time.

"Balsam slide with two specimens of the Psocid.

"In the spring of 1896 I visited this log and found the vial with specimens lost the previous year. These are in separate vial (alc) numbered 247[a]. The termites from this same collecting vial are in a separate vial and numbered 707."

The lost vial mentioned in this note has again been lost track of and its whereabouts is at the present time unknown.

The recently acquired material was taken in Florida by Mr. T. E. Snyder, who has kindly furnished the following field note regarding them:

"15290[a]. Miami Beach, Fla., April 10, 1918. Inquilines? With termite in decayed red mangrove log; with termite and in adjacent wood. Very much more active than the termite."

The above material, ten specimens in all, four from Hubbard and six from Snyder, forms the basis for the following description:

**Zorotypus hubbardi,** new species.

General habitus very like that of a termite. Entire insect beset with stout, inclined bristle-like hairs, those on the dorsal surface of the abdomen directed backwards and mostly arranged in two transverse rows on each segment, one post-mesial and one at the posterior margin. A few of these bristles towards the end of the abdomen are sometimes quite long, almost as long as the basal segment of the antenna, but for the most part they are less than one-half that long and those of the sides and especially on the venter of the abdomen are very small and short. These

bristly hairs are scattered over the entire insect, body and appendages, including even the palpi, those on the legs and other appendages smaller and shorter, some on the antennæ being somewhat longer and a few on the coxæ as long as or even longer than the average ones on the dorsum of the abdomen, but less stout.

Head from above about as long as broad, without a prominent nasus as common in wingless psocids. Antennæ thick and consisting of nine segments; basal segment large, the apical four-fifths swollen, the entire segment almost three times as long as the greatest width; second and third segments approximately a third narrower than the first and subequal in length, their combined length scarcely as much as that of the basal segment; fourth to ninth segments about the same thickness and length as the basal one, the fourth slightly shorter, and the ninth somewhat more pointed apically than the others. Mandibles subquadrate and heavily chitinized, with two major teeth and some smaller notches and with a few fine hairs on the outer side; between the mandibles and the antennæ is the clypeus, which is small and narrow, making the antennæ but little separated from the base of the mandibles; maxillæ large and well developed, from a side view forming no inconspicuous feature of the head in fresh material or specimens preserved in spirits, the tip pointed and chitinized and with several moderately long teeth and some short brush-like bristles; maxillary palpi consisting of five segments; basal segment short and generally inconspicuous, little longer than broad; second segment of about the same thickness as the basal one, thickening somewhat in about the apical two-thirds and about four times as long as the greatest width; third segment about as long as the second but a little thicker; fourth segment but little longer than the apical width, apically about as thick as the preceding segment but basally much narrowed, the tip concave; fifth and last segment noticeably longer than any of the preceding ones, nearly as long as third and fourth together, and somewhat thicker than any of the preceding ones, the margins very slightly rounded and the tip broadly rounded; labial palpi three-segmented, the basal two short and generally obscure and the apical one large and thick, being nearly as thick as the terminal segment of the maxillary palpi, and but a little shorter, the whole segment about three

times as long as the greatest width. Eyes wanting, two specimens on a slide in balsam showing pigmented lateral spots which may represent eye facets. Ocelli wanting.

Thorax well developed; pronotum from dorsal view about as long as broad, about as long as the meso- and metathorax combined, and very broadly rounded anteriorly and truncate posteriorly the sides very gently rounded and gradually convergent posteriorly where it is nearly a fourth narrower than anteriorly, the length about equal to the anterior width; mesonotum from above half as long as the pronotum and posteriorly broadly rounded, the sides straight and gradually divergent posteriorly, where the width is slightly greater than that of the posterior part of the pronotum; metanotum similar to the mesonotum in length and shape but a little broader.

Legs stout, coxæ very large and broad, being fully as broad as the femora; trochanters well developed, being of about the thickness of the apical tarsal segment and a little longer than broad; femora stout and decidedly swollen, about four times as long as broad and beset with small bristles except on the inner surface, which is naked, otherwise unarmed except the posterior ones, on the inferior caudal margin of which there are two black chitinized teeth, one at the basal and apical thirds; the hind femora are somewhat larger than the others and have eight or nine bristles on the lower margin in addition to the two larger chitinized teeth; tibiæ less than one-half as thick as their respective femora and of about the same length except the posterior ones, which are somewhat longer than the corresponding femora; the tibiæ are beset on every side by short bristles but are otherwise unarmed; the anterior ones on the anterior inferior margin with a series of a score or more bristles; tarsi consisting of two segments, the basal one triangular and very minute, the second one large, somewhat less thick than the tibiæ, about five or six times as long as broad and beset all over with short bristles which, like those on the tibiæ and femora, are not erect but considerably inclined. Claws two in number on each foot, slender, as long as the thickness of the terminal tarsal segment and abruptly curved at a right angle at about the basal fourth.

Abdomen but little flattened, from a dorsal view decidedly

broader mesially and apparently consists of seven dorsal segments in the female and eight in the male; apically there is a pair of short, thick, fleshy, unsegmented cerci, as thick as the basal segment of the antenna, a little longer than broad, apically moderately narrowly rounded and, like the rest of the insect, bearing bristly hairs, four or five at the tip being unusually long, the apical one being sometimes even as much as twice as long as the cercus itself; genitalia usually concealed, in alcoholic material some males have a somewhat chitinized compressed organ more or less exserted. A detailed study of the genital characters was scarcely possible with the material at hand.

Entire length from front of head to tip of abdomen two mm., of pronotum three-eighths mm.; of hind femora seven-twelfths mm.; antennæ one and one-third mm.

Described from a total of ten specimens; one male on card point, one female in alcohol and two specimens, probably male nymphs, in balsam on a slide, taken by H. G. Hubbard in galleries of *Leucotermes flavipes* Kol. at Haw Creek, Fla., on March 26, 1895; four males, one female and one mutilated specimen of doubtful sex, all in spirits, taken by T. E. Snyder, at Miami Beach, Fla., April 10, 1918, in galleries of a termite of a different genus and species than the above.

Type, male; allotype, female, from material taken by Snyder. These two specimens are preserved in a hermetically sealed tube of spirits.

Type U. S. N. M. Cat. No. 21835.

The above described species is related to *Zorotypus neotropicus* Silvestri from Costa Rica, but seems a little larger, and the proportionate length of the basal segment of the antenna is different and the number of setæ on the lower margin of the anterior tibiæ appear to be greater. The description of *neotropicus* makes no mention of the two chitinized teeth on the inferior caudal margin of the posterior femora, a character present in *hubbardi* and one scarcely likely to have been overlooked by Silvestri, and thus presumably not present in the Costa Rican species.

The Order Zoraptera was established by Silvestri* for the

*Bollet. Lab. Zool. Gen. Agr. Portici, vol. VII, p. 193–209, figs, I–XIII (1913.)

single genus *Zorotypus* containing three species, *guineensis* from Africa, *ceylonicus* from Ceylon and *javanicus* from Java. Excellent figures showing the general appearance and details of these interesting insects are given by the describer. Later* the same writer described a new species from the New World, *Z. neotropicus* from Costa Rica. Melander and Brues, Key to the Families of North American Insects, Plate 2, Fig. 26, copy one of Silvestri's figures showing the general appearance of *Zorotypus*.

Silvestri compares the Zoraptera with the Isoptera and with the Blattidæ and mentions the Dermaptera in this relation, but did not seem to consider any possible relationship with the Psocidæ. Thus it seems somewhat odd that they should have been considered psocids by Mr. Hubbard and others. The rapidity of movement was probably responsible, as structurally little similarity to Corrodentia seems to exist. The presence of cerci, the situation of the antennæ near the base of the mandibles and especially the general appearance show a wide divergence from the psocid type but a near relationship to termites.

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## NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART VI.

BY CHARLES P. ALEXANDER, LAWRENCE, KANS.

**Dicranomyia rhipidioides,** new species.

Antennæ black, moniliform ; general coloration brownish yellow, the præscutum with three dark brown stripes; wings grayish with sparse brown spots and subhyaline drops; *Sc* short, cell *1st* $M^2$ closed, elongate.

*Male.*—Length about 5.2 mm.; wing 6.9 mm.

Rostrum and palpi dark brown. Antennæ black, the flagellar segments moniliform, subglobular. Head dark.

Thorax pale brownish yellow, the præscutum with three dark brown stripes, of which the median stripe is very broad, the lateral stripes narrow, continued backward so as to suffuse the scutal lobes; postnotum darker. Pleura light yellowish brown. Halteres

*Id, vol. X, p. 120 (1916.)

short, pale. Legs with the coxæ pale yellowish brown; trochanters and femora dull yellow, the tips of the latter narrowly dark brown; tibiæ yellowish brown, passing into dark brown at about mid-length; tarsi brown. Wings strongly tinged with gray, sparsely marked with brown and subhyaline; small brown spots and seams at the arculus, origin of the sector, along the cord, and the outer end of cell *1st* $M^2$; stigma pale, rectangular; subhyaline drops as follows: before and beyond the stigma; end of cell $R^5$; cell *1st* $M^2$; a few small droplets in cells *M*, *Cu*, and *1st A*. Venation: *Sc* short, ending opposite the origin of the sector; $Sc^1$ slightly retracted from the tip of $Sc^1$; *Rs* long, strongly arcuated at origin, about twice the length of the deflection of $R^{4+5}$; *r* at the tip of $R^1$; cell *1st* $M^2$ very long, closed; outer deflection of $M^3$ about twice the length of *m*; $M^3$ beyond *m* but little longer than that portion of the vein before *m*; basal deflection of $Cu^1$ just beyond the fork of *M*.

Abdominal tergites dark brown, the caudal margins of the segments pale; sternites pale brown. Hypopygium with the pleurites long and slender, about twice the length of the appendages; ventral pleural appendage terminating in a slightly curved cylindrical point.

*Habitat.*—California.

*Holotype.*—♂, Alameda, Cal., May 26, 1915, (M. C. Van Duzee).

This fly bears a superficial resemblance to *Rhipidia fidelis* O. S., but may readily be distinguished by the structural details.

**Erioptera (Erioptera) pilipennis,** new species.

Related to *E. laticeps* Alex.; wings with a sparse pubescence in the apical cells.

*Female.*—Length 3.2 mm.; wing 5 mm.

Rostrum, palpi and antennæ black. Head dark gray.

Thorax dark gray, the pleura a little brighter. Halteres pale. Legs with the coxæ and trochanters brownish yellow; femora dark brown, more yellowish basally; tibiæ and tarsi dark. Wings grayish; veins dark brown; a distinct though sparse pubescence in the centres of the apical cells from $R^2$ to $Cu^1$, inclusive. Venation: almost as in *E. laticeps* but *Rs* longer; $R^{2+3}$ longer; *r*

inserted farther out on $R^2$ and closer to the tip of $R^1$; $Cu^1$ at the fork of $M$.

Abdomen dark gray; ovipositor horn-coloured.

*Habitat.*—Oregon.

*Holotype.*—♀, Hood River, Oregon, June 2, 1917, (F. R. Cole).

In our fauna this species resembles *E. laticeps*, from which it is readily separated by the sparsely pubescent wings, the venation and the coloration of the abdomen.

**Erioptera (Mesocyphona) needhami,** new species.

Related to *E. dulcis* O. S.; coloration pale grayish yellow, the mesonotum with four separated brownish stripes; legs white with a brown ring before the tips of the femora; tip of the tibiæ not darkened.

Length 4–4.2 mm.; wing 3.8–4 mm.

Rostrum and palpi dark brown. Antennæ yellow, the terminal segments of the flagellum a little darker. Head pale.

Thorax pale grayish yellow, the præscutum with four narrow, dark brown stripes, the median pair widely separated from one another, lying outside the tuberculate pits; lateral stripes on the margin of the sclerite. Pleura with two narrow, dark brown stripes enclosing a broad, silvery stripe; sternites silvery. Halteres pale, knobs brown. Legs with a broad, dark brown ring before the tips of the femora; remainder of the legs white excepting the slightly darkened last two tarsal segments. Wings grayish brown, dark brown on the anterior half, fading into grayish on the posterior half; a few large, whitish spots on the surface including the arculus, origin of $Rs$, $Sc^2$, $Sc^1$, $R^1$, $R^2$, along the cord and smaller spots near the tips of the other longitudinal veins.

Abdomen yellow, the segments marked with brown; hypopygium yellow; sternites with an interrupted dark brown lateral stripe and a less distinct but broader, pale brown median stripe.

*Habitat.*—Eastern United States.

*Holotype.*—♂, Sacandaga Park, Fulton Co., N.Y., June 17; 1910.

*Allotype.*—♀, with the type.

*Paratopotypes.*—Abundant specimens of both sexes.

This species is related to *E. dulcis* O. S. (Western United States) but is much paler, the legs white and completely lacking the dark tibial tips of *dulcis*. The fly is very common throughout the Eastern States. My distribution sheets indicate a wide distribution (Maine, Vermont, Connecticut, New York, Pennsylvania, New Jersey, Maryland, Virginia and North Carolina). The fly has hitherto been determined as *dulcis* by Mr. Johnson and the writer, but comparison with authentic specimens of *dulcis* show that it requires a new name, and I take great pleasure in dedicating the form to Dr. James G. Needham.

**Gonomyia** (**Gonomyia**) **spinifer,** new species.

Related to *G. cognatella* O.S.; thoracic pleura with a broad, dark brown stripe; abdominal tergites dark brown, tipped with yellowish; sternites yellow; male hypopygium with the ventral pleural lobes elongate, on the dorsal face before the tip with a sharp spine.

*Male.*—Length 3.8–4 mm.; wing 4.9–5 mm.

*Female.*—Length 3.8 mm.; wing 4.8 mm.

Rostrum and palpi dark brown. Antennæ with the scape light yellow, the flagellum dark brown. Head yellow.

Thorax yellow, the præscutum with three broad, brown stripes that are confluent behind. Pleura yellow with a rather broad, dark brown stripe extending from the cervical sclerites to the base of the abdomen and including the halteres; sternites dusky. Halteres pale. Legs dull yellow, the tips of the femora and tibiæ and the terminal tarsal segments a little darker. Wings pale gray; stigma indistinct, pale brown; veins dark brown. Venation: *Sc* short ending far before the origin of *Rs*, this distance a little longer than *r-m; $R^{2+3}$* arcuated, a little longer than the sector; veins $R^2$ and $R^3$ divergent at the wing-tip; cell *1st* $M^2$ open by the atrophy of $M^2$; basal deflection of *Cu1* before, at or just beyond the fork of *M*.

Abdominal tergites dark brown, the caudal-lateral angles of the segments yellowish; hypopygium yellowish; sternites light

yellow. Male hypopygium with the ventral pleural lobe elongate, fleshy, projecting far beyond the other appendages, on its dorsal face before the tip with a sharp, dark-coloured spine. Penis-guard narrow subtended on either side by a sharp, curved chitinized hook whose points are directed ventrad; these hooks are unequal in size, one being much smaller and feebler than the other; at its apex the guard ends in a slender dorsally curved hook. Female ovipositor with the valves long and straight.

*Habitat.*—California.

*Holotype.*—♂, Los Cerritos, Cal., March 19, 1915, (M. C. Van Duzee).

*Allotype.*—♀, with the type, March 14.

*Paratopotypes.*—2 ♂'s.

**Tipula entomophthoræ,** new species.

Mesonotal præscutum gray with three brown stripes; wings gray with a broad cross-band of white beyond the cord; vein $R^2$ persistent for its entire length; male hypopygium having the ninth tergite deeply notched medially, the lateral angles obliquely truncated.

*Male.*—Length about 18 mm.; wing 15.8 mm.

Frontal prolongation of the head elongate, yellow above, dark brown beneath and on the sides. Antennæ with the three basal segments brownish yellow, the remainder of the flagellum dark brown. Head gray with an indistinct, median brown line.

Thoracic pronotum gray, narrowly brown medially. Mesonotal præscutum light gray with three dark brown stripes that are centred with gray, the median stripe narrowed behind. Pseudosutural foveæ prominent. Scutum with two brown marks on each lobe; median lobe of the scutum and scutellum with a very narrow, brown line; postnotum yellowish brown. Pleura clear gray. Legs with the femora dull yellow, the bases brighter, the tips more infuscated; tibiæ and tarsi dark brown. Halteres broken. Wings brown, gray and whitish, cross-banded. A dark area at the arculus and cross-vein *h*, another at the origin of the sector, a large area at the stigma continued down to cell *1st* $M^2$;

apex of the wing brown including the apical half of cells $R^2$ and $R^3$, the apical two-thirds of cell $R^5$ and all of cells $M^2$ and *2nd* $M^2$; remainder of the wing grayish brown with a large, white cross-band beyond the stigma extending clear across the wing except the apex of cell $M^3$; a broad cross-band before the stigma and beyond the origin of the sector extending into cell *M;* a large white blotch in the base of *M* and the basal half of cells *Cu* and *1st A*. Venation: $R^2$ persistent for its entire length; petiole of cell $M^1$ short, a little longer than *m; m-cu* short but evident.

Abdomen dull yellow, the tergites and sternites with a broad, median brown line. Pleural region and sides of the sternites brownish. Hypopygium brown. Male hypopygium with the ninth tergite large, sub-quadrate, the caudal margin with a deep U-shaped notch, this latter medially with a still smaller but similar notch; lateral angles obliquely truncated. Ninth pleurite complete, large, the ventral portion with dense long setæ; outer pleural appendage narrow at base, expanded into a flatted blade which is covered with numerous long stiff setæ; inner pleural appendage terminating behind in a scoop-like lobe that is two-toothed, the inner tooth longest and acutely chitinized, the convex lower surface with long, pale hairs; anteriorly the blade is white, very flattened, the outer edge heavily chitinized, jet-black, the tips expanded, in a position of rest lying beneath the ninth tergite. Ninth sternite with a deep, median notch behind which is a membranaceous area; margin of the sternite adjoining the pleurite setigerous, the posterior portions smooth.

*Habitat.*—North Carolina.

*Holotype.*—♂, Cranberry, N. Car. (Roland Thaxter.)

*Paratopotype.*—♂, in the author's collection.

This species is related to *T. angulata* Lw, *T. penobscot* Alex., *T. subfasciata* Lw., etc., but is separated from all by the structure of the male hypopygium and from the last two species by the complete vein $R^2$. The material was heavily infested with the type-material of *Entomophthora caroliniana* Thaxter. The type and two additional specimens have been placed in the M.C.Z. collection by Dr. Thaxter.

(To be continued)

## THE OTTAWA NATURALIST.

To the officers of the Ottawa Field-Naturalists' Club we extend our hearty congratulations on the great improvement in the appearance of the new volume of its organ, THE OTTAWA NATURALIST. The size is considerably larger, the number of pages increased, while the quality of the paper is vastly superior, being adequate to the needs of the best half-tone illustrations, as shown by the excellent plate of photographs of mushrooms, accompanying Mr. F. W. Waugh's article on "Wild Plants as Food." The magazine also gains in appearance by the attractive design on the cover.

THE OTTAWA NATURALIST, which was established in 1887, is one of the oldest natural history periodicals in North America. It is the only Canadian magazine whose scope extends to all branches of the subject, and it should, therefore, receive the hearty support of nature lovers, teachers and educational institutions throughout the country; as without an adequate subscription list it cannot be expected to maintain the high standard it has now reached. The subscription price, one dollar per year, remains unchanged, and for this small sum a volume consisting of nine numbers is offered.

In the wider sphere of usefulness upon which it is entering we wish THE OTTAWA NATURALIST a long and successful career.

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## BOOK NOTICE.

Report of the Proceedings of the Second Entomological Meeting, held at Pusa on the 5th to 12th February, 1917. Edited by T. Bainbrigge Fletcher, F.L.S., F.E.S., F.Z.S., Imperial Entomologist, Calcutta, 1917. Rs. 3 or 4s. 6d.

This volume does not consist of a series of separate contributions from different writers but is virtually a summary or abstract of the current knowledge of the insects injurious to Indian crops of all kinds, based upon notes prepared before the Meeting by the Imperial Entomologist and the discussions of these which took place at the Meeting.

To the general reader and those unfamiliar with the peculiar problems that confront the economic entomologist in India, the introductory remarks by Mr. Fletcher will be found interesting. He gives much sound advice on the need of exactness in the making of observations and recording of data. The life-histories of most Indian insects are as yet very imperfectly known, and there are gaps in our knowledge of the life cycles of some of the commonest species, such as, e. g., *Agrotis ypsilon* and *Pieris brassicæ*, both of which, during certain months, disappear completely from the affected regions, the adults suddenly reappearing after a long absence to deposit their eggs. Their disappearance is probably due to migration, but nothing is definitely known as to their movements. Such information is necessary in order to determine the most effective methods for their control.

In the body of the report the various crops are taken up in order, the pests enumerated in each case, and each species is then discussed in its turn. On account of the enormous field covered the specific accounts of the numerous pests are necessarily very brief; the object of the meeting having been to bring up for discussion any questions or recent observations by the members, on matters of importance in their work. It should be remembered, in this connection, that in India there is but one entomological staff, the work of the provinces being under the advice and direction of the Imperial Entomologist.

In order to give the reader some idea of the variety of crops and other plants grown for useful purposes in India, the following classification employed in the report may be quoted from the table of contents. The figures refer to the number of different crops listed under each heading: Hill crops, 6; leguminous field crops, 24; oil seeds, 7; Malvaceæ, 10; non-malvaceous fibre crops, 3; sugar cane, paddy (rice) and other cereals, grasses and fodder crops, 23; fruit-trees, 38; palms, 4; garden plants, 15; drugs and dyes, 5; cruciferous crops, 10; other vegetables and condiments, 31. There is also a section on stored products, 3.

The various insect pests discussed and the crops they infest are so numerous and so unfamiliar to most of our readers that it would be useless to give them more than a passing notice. A few

of the destructive species are also well known in America, such as *Heliothis obsoleta*, *Cirphis unipuncta*, *Agrotis ypsilon* and *Aphis brassicæ*, and many others belong to familiar genera, e. g., *Diacrisia obliqua*, a woolly-bear, which attacks a great many plants and sometimes occurs in very destructive numbers. Among the more important crops cotton suffers from a very long list of pests, including several species of boll-worms (*Earias fabia*, *E. insulana*, *Gelechia gossypiella*). The American boll-worm, *Heliothis obsoleta*, also occurs on cotton but is not destructive, preferring other plants, particularly certain of the leguminous field crops. Rice or "Paddy," the most important of all Indian crops, also suffers from a great variety of pests, of which the most important of all is *Schœnobius bipunctifer*, a moth whose larva does enormous damage by boring in the stalks. It is estimated that the injuries caused by this one insect in Southern India alone amount to one hundred millions of Rupees annually. *Pachydiplosis oryzæ*, a gall midge, is another very destructive enemy of rice. Two of the other pests of rice are not insects but crustaceans, a land crab, *Paratelphusa hydrodromus*, and a Phyllopod, *Apus cancriformis*. Wheat and oats are both attacked by the common Army-worm (*Cirphis unipuncta*) and other species of Cirphis, but the most important pest of wheat seems to be a termite (*Microtermes anandi*), which destroys seedlings and sometimes also plants that are coming into ear.

Of the numerous fruit-trees, mangos are among the most widely grown and the most extensively attacked by insects. No less than 57 species attack the various parts of this tree. The principal enemies of the fruits are weevils of the genus *Cryptorhynchus* and three species of fruit-flies, *Chætodacus* spp., this genus being the one to which most of the fruit-flies of the region belong. The general question of the control of fruit-flies is taken up at some length under the discussion of insects affecting the peach.

On account of the fact that agriculture in India is practised chiefly by the natives whose superstitious beliefs and utter ignorance of the life-histories of insects are deep-rooted and difficult to overcome, the methods of controlling insect pests must needs be of the simplest character. Hence we find that the use of in-

secticides is rarely possible on an effective scale, and it is necessary in most cases to resort to such simple expedients as hand-picking, destruction of affected parts, the use of bait and light traps, bag-nets, etc. Considerable experimental work is being done, however, in the use of insecticides and the introduction and dissemination of parasitic and predaceous insects is also receiving much attention.

The report is beautifully illustrated by 35 coloured plates of very fine quality, each showing the life-history of a single species of insect.

## RECENT CANADIAN PUBLICATIONS.

(Continued from page 356.)

THE ORTHOPTERA ((COCKROACHES, LOCUSTS, GRASSHOPPERS, CRICKETS) OF NOVA SCOTIA; WITH DESCRIPTIONS OF THE SPECIES AND NOTES ON THEIR OCCURRENCE AND HABITS.—By Harry Piers, Curator of the Provincial Museum of N. S. From Trans. N. S. Inst. Sc.; vol. XIV, pp. 201–356, with 4 plates. Halifax, N. S., 1918.

It is gratifying to note the growing interest in systematic entomology in Nova Scotia. Through the combined efforts of Messrs. Piers and C. B. Gooderham considerable information has been gathered on the distribution and habits of the native species of Orthoptera, a group of which until recently little has been known in the Maritime Provinces.

The fauna is very sparse, only 26 species having been recorded, although two others are included as being practically certain to occur in the Province. This is somewhat surprising in view of the fact that the Transition Zone is said to be represented in the Province, and many other species range throughout this zone in eastern North America. Possibly intensive collecting in a larger number of localities will reveal a fair number of additional forms, though the author believes the total number will never exceed about 35.

In Part I, which contains general matter introductory to the study of the Orthoptera, there is also a valuable historical account of our knowledge of the Nova Scotia species, in which the author

has been able to establish the identity of the species recorded by Francis Walker (Cat. Derm. Salt. Brit. Mus., 1869-71). This part also contains an account of the life zones of Nova Scotia with the distribution of the Orthoptera within these, useful information on climatic conditions of the Province in relation to the time of hatching and other phenomena of seasonal distribution, and some interesting comparisons between the faunas of Nova Scotia and other regions in Eastern North America, more particularly New England.

Part II contains keys to the families, genera and species, with descriptions of each form and full notes on distribution, both general and local. There are also many interesting notes on habits haunts, stridulation, etc. A very full account is given of the variations in Nova Scotian specimens of the common field cricket, *Gryllus pennsylvanicus* (*G. assimilis*).

The following minor errors may be noted here:

P. 256. *Nomotettix cristatus* has been reported from Go Home Bay, Georgian Bay, Ont., in addition to the Toronto record (39th Ann. Rep. Ent. Soc. Ont., 1909, p. 113.)

P. 297. The macropterous form of *Melanoplus fasciatus*, stated to be known only from Michigan, has been reported also from Lake Simcoe (Can. Ent., XXXI, p. 32), Fort William and the Temagami District Ont. (l. c., XLI, pp. 142, 207).

P. 325. The genus Ceuthophilus is now referred to the subfamily Rhaphidophorinæ, not the Stenopelmatinæ.

P. 336. Concerning *Nemobius carolinus* it is stated that the present author "does not report it from Ontario (1904), although his common *N. angusticollis* seems to be a somewhat related form." The latter name has been placed in the synonymy of *N. carolinus* (Walker, Can. Ent., XLI, p. 211).

The paper is illustrated by four plates and several text figures, characters of all the species being shown.

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Dragonflies (Odonata) of Alberta.—By F. C. Whitehouse. Published by the Alberta Natural History Society, Red Deer, March, 1918. 16 pp. 44 figs.

We welcome this first entomological contribution from the Alberta Natural History Society, and hope that many more will

be forthcoming. So little is known of the insects of Alberta that Mr. Whitehouse's work makes a valuable addition to our knowledge of the fauna of this Province.

The author has aimed to make the paper useful to the beginner and he has, therefore, avoided all but the most necessary technical terms, and has made the descriptive notes as brief and simple as possible. They are not intended to enable the student to determine all his captures with certainty, but with the help of the figures, which in most cases illustrate the male appendages, (these being usually among the most useful characters), the identification of the males, at least, of most of the species, should not be a difficult matter, especially as the Alberta fauna is not a very large one. There are 43 species actually recorded from the Province and 12 others are included as probably occurring there.

The omission of exact localities and dates of capture, though regrettable from the specialist's standpoint, is, no doubt, due to the author's object of merely providing a simple guide for the use of the beginner, this information having been already published for most of the species in Mr. Whitehouse's papers on the Odonata of the Red Deer District (Can. Ent., XLIX, pp. 96–103; L, pp. 95–100). As a substitute, a key is given to the seasonal distribution, with remarks on the range within the Province and the relative frequency of occurrence of each species. The data for the seasonal distribution is, however, in most cases insufficient and must vary considerably according to altitude and other factors. It is, in some cases, based on a single record, which has no value for such a purpose, and in other cases the records are from localities outside of Alberta, which are equally valueless. To this extent, therefore, the key is misleading.

Unfortunately, through no fault of the author, the numbering of the pages has been omitted.

We hope that this useful little guide will stimulate others to take up the study of dragonflies in this interesting region where mountain and prairie faunas meet.

(To be continued.)

Mailed November 13, 1918.

The Canadian Entomologist.

Vol. L. LONDON, DECEMBER, 1918 No. 12

## POPULAR AND PRACTICAL ENTOMOLOGY.

### Practical Results in Spraying a Commercial Orchard for the Green Apple Bug.

By W. H. Brittain, Provincial Entomologist for Nova Scotia.

The cost of spraying for sucking insects is so much higher than for fungous diseases and biting insects, that even progressive fruit growers sometimes hesitate before applying the remedies recommended for insects of this type. In the case of orchard aphids, it is often difficult to advise a definite course of action—outbreaks of these insects are so dependent upon climatic conditions and the action of parasitic and predaceous enemies. In the case of severe infestations of the Green Apple Bug (*Lygus communis* var. *novascotiensis* Knight), no such hesitation need be experienced. An abundance of data has now been accumulated, which shows that even when a single year only is considered, economically profitable results can be expected, though, of course, the benefit from the work should be considered over a period of years. The tables accompanying this paper give details of the results of control operations in one orchard. Needless to say, such results can only be obtained by a thorough knowledge of the life-history and habits of the pest and by the most thorough and searching work.

The orchard for experiment was taken over in 1917 as a demonstration in the control of the Green Apple Bug. One part, comprising approximately 6 acres, consisted of very large 60 year old trees of mixed varieties; another part consisted of about four acres of 30 year old trees, mostly Golden Russets. The remainder consisted of a mixed lot of trees of varying ages, but mostly younger than the Golden Russets, comprising between two and three acres. This lot was very thickly planted and set with fillers of plums, pears, etc.

The work of the insects was first noticed in the old orchard where the infestation was still most severe. Here it was gradually rendering the trees worthless, reducing the crops of the chief

varieties to such an extent as to scarcely repay picking. The work of the insects was, for the three years in which we had it under observation, so severe that most of the blossoms would be stung to death before forming fruit. In most cases these trees would blossom heavily, but any fruit that was able to set would soon be punctured by the bug and either drop to the ground or develop into a gnarled or twisted apple. The damage to the smaller twigs was also very apparent, a great deal of the fruiting wood being severely damaged by repeated punctures and covered with scars resulting therefrom. Much of the young growth had been killed outright. The past was now becoming similarly injurious in the Golden Russet orchard and, while the damage to the twigs had not here reached such a state as in the older trees, the crop was gradually and steadily being destroyed. Finally, the bug was rapidly gaining a foothold in the remaining part of the orchard, though the infestation was far from being as severe as in the rest.

The whole orchard, with the exception of the smallest part mentioned above, which was sprayed by the owner, was treated for Green Apple Bug, nicotine sulphate (blackleaf 40), 1 pint to 100 gals. being used. In the spray immediately before the blossoms opened, this was combined with lime sulphur and arsenate of lime. In the after-blossom spray, the fungicide was sodium sulphide ("soluble sulphur") and the arsenical poison was omitted. All our attention was concentrated on spraying for the bug, and when weather conditions were such that injury from the application of the fungicide seemed likely, it was omitted from the spray. A "Friend" spray gun was used throughout the work, as this instrument proved more effective than the ordinary nozzles.

On the Golden Russet orchard and on the Gravensteins in the large orchard, the spray was applied under ideal conditions and resulted in the practical elimination of the bug. A few might still be found in the tops of the trees, but their number was insignificant and they were able to accomplish little damage. In the remainder of the old trees, trouble with the outfit resulted in considerable delays, and most of this block failed to receive the first and most important spray, so that it was only with great difficulty and by

taking the utmost pains that we were able to secure a fair measure of control.

In analyzing the results of this work we are unable to make comparison with check plots, as the owner did not desire to leave any trees untreated, and to have done so would have disturbed our

COMPARISON OF VALLEY CROP WITH THAT OF EXPERIMENTAL ORCHARD.
TABLE No. 1.

| Year | Total crop for entire valley bbls. | Percentage of previous seasons' crops | Total actual crop in orchard | Percentage of previous years crops all varieties | Total theoretical crop in orchard | No. bbls. Grav. | No. bbls. N apareils | No. bbls. Russets |
|---|---|---|---|---|---|---|---|---|
| 1910 | 323,000 | | | | | | | |
| 1911 | 1,740,000 | 538.7 | 2200 | | | 220 | 95 | 600 |
| 1912 | 993,338 | 57.1 | 1800 | 81.4 | 1256 | 206 | 55 | 400 |
| 1913 | 650,901 | 65.5 | 1300 | 72.4 | 1179 | 123 | 110 | 81 |
| 1914 | 650,900 | 100.0 | 780 | 60. | 1300 | 159 | 4 | 75 |
| 1915 | 613,882 | 94.3 | 560 | 71.8 | 735 | 90 | 1 | 46 |
| 1916 | 681,470 | 111.0 | 360 | 64.3 | 621 | 39 | 3 | 25 |
| 1917 | 744,730 | 109.26 | 1465 | 406.9 | 393 | 246 | 75 | 330 |

sprayed plots to some extent, owing to the flying in of adults from the untreated plots. It was, therefore, necessary to compare the quantity and quality of apples obtained in 1917 with that obtained in previous years, and further to compare this with the general crop for the whole Valley over the same period. This is to make certain that the results obtained actually represent the effects of our work, and not of other factors which might have operated over the entire district. Last of all, we will compare the results obtained by our own work with those obtained on the portion sprayed by the owner, as far as this is possible. In doing so, it should be remembered that the conditions in that part were not ideal for good work and that the comparative inexperience of the man who did the spraying, would render effective control unlikely. On the other hand, however, the infestation in this part of the orchard was much lighter than the rest.

Table No. 1 shows that in 1911 there was a phenomenally large crop, following an abnormally low one of the previous year. The crop of 1912 was also large, but since that year the fluctuations have not been wide.

For the purpose of better emphasizing the result of our work in the orchards, the table gives not only the actual crop, but also a "theoretical crop." This is obtained by calculating the crops which the orchard would have yielded had it followed the general average for the Valley. For example, the crop for the entire Valley in 1916, was 111% of the 1915 crop. The 1915 crop in the experimental orchard was 560 barrels; therefore, the theoretical crop could be 621 barrels, though the actual crop was considerably below that figure, viz., 300 barrels. By comparing the theoretical crop, obtained in this way with the actual crop, we find that up to and including the year 1913 the crop in the orchard is better than the average, but in 1914, it dropped below and continued to do so every year until 1917. This period corresponds with the increasing severity of the infestation of the Green Apple Bug as shown by actual observation. The figures for the three leading varieties show in a very striking manner the steady falling off in yield, and no one who watched the work of the pest in the orchard could doubt that it was the cause of the decline. In 1917, the year the treatment was given, the crop for the entire Valley was 109.26% of the previous crop, while the crop in the orchard was 406.9% of the crop of the previous year. Expressed differently, the actual crop was 1,469 barrels, while the theoretical was 393 barrels.

PERCENTAGE OF DIFFERENT GRADES OF ALL VARIETIES IN ENTIRE VALLEY AND IN EXPERIMENTAL ORCHARD

TABLE No. 2.

| Year | Per Cent. of Different Grades in Entire Valley. | | | Per cent. of Different Grades in Experimental Orchard. | | |
|---|---|---|---|---|---|---|
| | No. 1 | No. 2 | No. 3 | No. 1 | No. 2 | No. 3 |
| 1912 | 39.5 | 15.2 | 45.3 | 49.6 | 16. | 34.4 |
| 1913 | 32.10 | 14.4 | 53.5 | 33.9 | 18.4 | 47.7 |
| 1914 | 50.1 | 23.3 | 26.6 | 59.3 | 22.4 | 18.3 |
| 1915 | 34.1 | 11.1 | 54.8 | 22.2 | 7.6 | 70.2 |
| 1916 | 40.3 | 18.9 | 40.8 | 49.9 | 18.8 | 31.3 |
| 1917 | 34. | 20.8 | 45.2 | 65.3 | 12.4 | 22.3 |

PERCENTAGE OF DIFFERENT GRADES OF ALL VARIETIES IN EXPERIMENTAL ORCHARD, IN 1917.

TABLE No. 3.

| Variety | Per Cent. of Different Grades on Portion Sprayed by Owner. | | | Per Cent. of Different Grades on Portion Sprayed by Department. | | |
|---|---|---|---|---|---|---|
| | No. 1 | No. 2 | No. 3's & Culls | No. 1 | No. 2 | No. 3's & Culls |
| Grav | 28.9 | 4.6 | 66.5 | 43.5 | 9.6 | 46.9 |
| Ribston | 53.8 | 19.4 | 19.4 | 77.3 | 9. | 13.7 |
| Kings | 33.5 | 19.3 | 47.2 | 72.1 | 13. | 14.9 |
| Mann | 53.8 | 17.4 | 28.8 | | | |
| Wagner | 37. | 25. | 38. | | | |
| Can. Orange | 40.8 | 28.9 | 30.3 | | | |
| Pewaukee | 40. | 40. | 20. | | | |
| Golden Russet | | | | 20.9 | 49.3 | 29.8 |
| Blenheim | | | | 74.3 | 11. | 14.7 |
| Baldwin | | | | 66.4 | 12.9 | 20.7 |

It should be noted here that the orchard in question has always received better than average care. Before the infestation of the bug began to make itself felt, it yielded crops considerably above the average. It has always been sprayed for apple scab and biting insects, and the quality of fruit has generally been better than the average in spite of the increasing number of gnarled and twisted fruit due to the work of the bug. The percentage of different grades obtained since 1911, is shown in Table No. 2.

Lastly, a comparison of the different grades of fruit in the orchard treated by us and by the owner, shows a decided advantage in favour of the former, as shown by Table No. 3. This was largely due to the smaller percentage of twisted fruit, as the scab control was about equal. As previously stated, the natural infestation in that part of the orchard treated by the owner was much lighter than in the remainder.

A comparison of the conditions in the experimental orchard in 1918 with those of the previous season is of interest. This year the orchard was not sprayed for the Green Apple Bug. Careful examination of the orchard shows that in the older, larger trees, there is still a considerable infestation, though not quite so severe as formerly, while in the Golden Russet orchard, where it will be remembered the best work was done in 1917, the pest could only be found by searching. The necessity of doing timely, thorough work from the standpoint of future years' infestations, is thus further emphasized.

## NOTES ON CHALEPUS RUBRA WEB., IN NEW JERSEY.

BY ALAN S. NICOLAY AND HARRY B. WEISS,* NEW BRUNSWICK, N. J.

This species occurs throughout New Jersey, and according to Smith's List is common during May, June and September on locust and sometimes on basswood. Blatchley in his "Coleoptera of Indiana" states that it occurs on locust, oak, soft maple and basswood. Neither of these publications mentions the leaf mining habits of the larva. Chittenden, in his paper on "The Leaf-Mining Locust Beetle with Notes on Related Species," (Bull. 38, N. Ser., U. S. Div. Ent.) states that Harris discovered the larva in 1827 mining the foliage of white oak (Harris, Bost. Jour. Nat. Hist., vol. I, pp. 141-151, 1835) and further records it from New York during June and as late as September.

According to Beutenmuller, it mines the leaves of apple and linden, and the adult is recorded as occurring on white birch, hornbeam, cherry, Juneberry and *Pyrus arbutifolia*. Harris in his "Insects Injurious to Vegetation" lays stress on its importance as an apple pest and mentions chokecherry and shadbush as additional food plants. Chittenden (loc. cit.) states that its life-history appears to be similar to that of the locust beetle *C. dorsalis* Thunb., and records from published statements that the beetles appear during the last of May and deposit eggs on the host leaves in which the larvæ mine. The eggs are described as small, round and of a blackish colour, being fastened to the surface of the leaf either singly or in groups of four or five.

In New Jersey we have found the mines not uncommon on the leaves of various species of oaks, each one usually being at the edge of a leaf. The larva eats all of the parenchyma in its, mine resulting in the mine being visible on both leaf surfaces. It shows plainest, however, on the upper surface as a white elongate irregular discoloration. During the last half of June and first half of July the larvæ can be readily found within their mines. We have never found more than one larva in a mine. The pupal stage requires about two weeks and occurs the last week in July and first part of August, the beetles emerging during the second week of August and later. After emerging from the pupa case the beetles are light yellowish red, without distinct markings.

*The arrangement of the authors' names is alphabetical.

After remaining in the larval mines for several days the colours become darker and the markings more distinct.

*Full grown larva.* Length 7.5 mm. Elongate, composed of 13 segments, very little tapering posteriorly. Colour white except the head, most of the first thoracic segment, legs and upper side of anal segment, which are brownish or brownish red. Thoracic and abdominal segments convex above and less so below. Head subquadrate, flat, shining, with median dorsal line groove terminating in an inverted V. Head about ½ the greatest width of the first thoracic segment. Antennæ 3-jointed, joints of equal length. First thoracic segment 1½ times the length of the second. Second and third of equal length. Thoracic segments of equal width, sides arcuate. Sides of abdominal segments 1 to 8 produced into triangular tubercles (giving abdomen a notched appearance) capped with minute globular tubercles bearing several minute hairs. First thoracic segment bearing a faint, median dorsal impressed line with a transverse, foveiform impression on either side. Dorsal surface of 2nd and 3rd thoracic segments and abdominal segments 1 to 8 each with a transverse, median impression and a short, oblique one on either side. Ventral surface of abdominal segments 1 to 8 similar to dorsal surface except that the transverse impressions are somewhat curved. Nine pairs of stigmata, one pair on second thoracic segments, and a pair each on all abdominal segments except the 8th. Each abdominal spiracle situated at the base of the lateral tubercle a little before the middle of the segment, the ninth pair in the dorsal surface of the anal segment. Thoracic and anal stigmata larger than the others.

*Pupa.* Length 6.5 mm. Resembles larva in general shape but is shorter and more convex. Colour reddish brown. Abdomen showing lateral tubercles conspicuous in larva, each tubercle bearing 2 or 3 long bristles. Dorsal surface of 1st thoracic segment bearing 6 pairs of minute tubercles arranged in a triangle of three on either side of a fine median white line, each tubercle bearing a long spine-like hair. Dorsal surface of each abdominal segment bears 10 minute tubercles, (4 medially and 3 lateral ones on either side) each bearing a long spine-like hair. A pair of spine-like hairs

at the base of each antenna. Tip of mesothoracic wing-pad bearing several bristles. Distal ends of femora each bearing a pair of minute tubercles tipped with long spine like hairs. Ventral surface of each abdominal segment bearing several tubercles and spine-like hairs, those on last two segments being the most prominent. By reason of this armature and abdominal movements, the pupa can move quickly and readily.

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Explanation of Plate XI.

Figs. 1 and 3. Oak leaves showing mines of *C. rubra*.

Fig. 2. *Chalepus rubra* (after Chittenden in Bull. 38, N. Ser., U. S. Div. Ent.).

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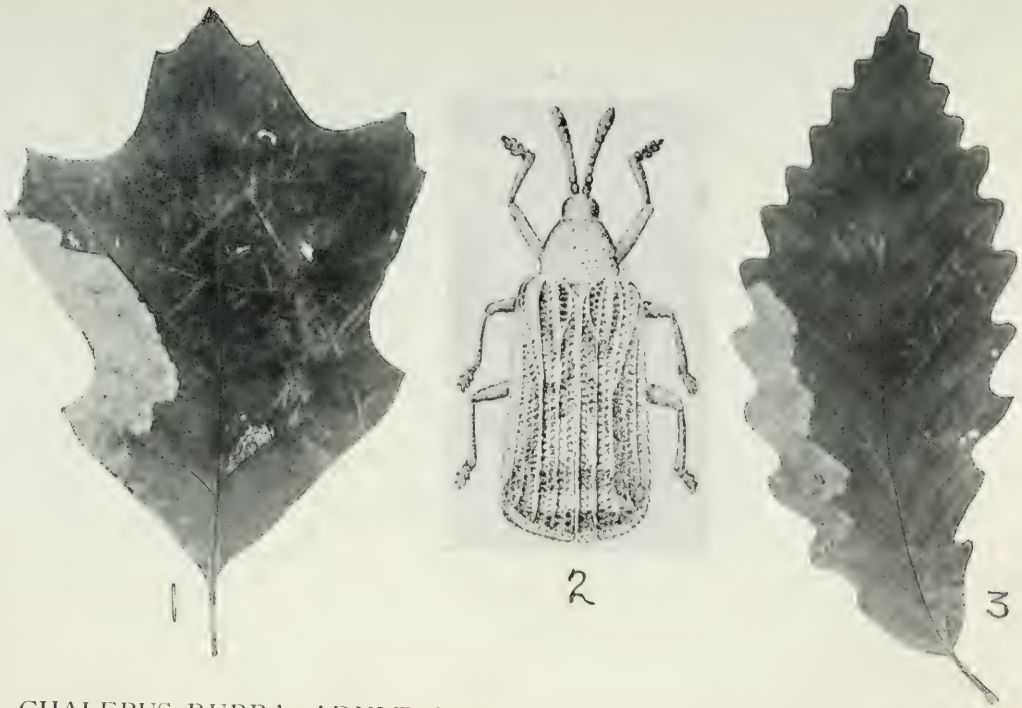
## AN ENTOMOLOGIST WANTED.

The Civil Service Commissioners of Canada hereby give public notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

An Assistant Entomologist in the Entomological Branch of the Department of Agriculture in Grade "C" of the First Division at an initial salary of $2,200 per annum. Candidates must be graduates of a recognized university, and must possess a good working knowledge of the classification of the orders of insects in addition to any special knowledge they possess of particular groups. Candidates should submit a statement of their training, experience and other qualifications, also a list of the entomological papers published by them, together with copies of such papers when possible.

Applications should be sent at the earliest possible date to the Secretary of the Civil Service Commission, Ottawa, from whom application forms may be obtained. Particulars with regard to the duties of this position may be obtained from the Dominion Entomologist.

December, 1918




CHALEPUS RUBRA, ADULT AND LARVAL MINES IN OAK LEAVES.

# THE LIFE-HISTORY AND EARLY STAGES OF CORYTHUCHA PARSHLEYI GIBSON.

BY HARRY B. WEISS AND EDGAR L. DICKERSON, NEW BRUNSWICK, N.J.

This species was described by E. H. Gibson in the Trans. Amer. Ent. Soc. XLIV, 69-104, April 4, 1918, from specimens collected by us on walnut at Hammonton, N.J. In the above publication, Gibson states that the food plants are walnut and juneberry (*Amelanchier intermedia*). When we first collected this species on walnut, specimens were submitted to Mr. Parshley together with specimens of *C. cydoniæ* from juneberry. When Mr. Parshley sent the specimens to Mr. Gibson for description, it is quite possible that the host labels might have been accidentally changed. However, repeated visits to the type locality, Hammonton, N.J., and numerous examinations of both walnut and juneberry have resulted in finding the species only on the former plant.

In New Jersey we have found *parshleyi* at Hammonton on butternut (*Juglans cinerea*), walnut (*Juglans nigra*) and Japanese walnut (*Juglans sibboldiana*), and at Cedarville and Bridgeton on walnut. An additional locality in New Jersey is Ramsey, by Dr. F. E. Lutz. Records of its occurrence outside of New Jersey are: Lake Waccamaw, N.C., April 20, (on pecan) (R. W. Leiby) and Great Falls, Va., Sept. 5, (on walnut) (Coll. of H. G. Barber). It undoubtedly occurs in many other localities and is possibly wrongly labeled in collections as *Corythucha juglandis* Fitch.

The following observations relative to *C. parshleyi* were made at Hammonton, which is in the southern part of New Jersey. Overwintering adults appeared about the middle of May, and during the third and fourth weeks of this month egg laying was well under way. From one to four eggs were laid in the angles formed by the mid-rib and the side ribs on the under leaf surfaces. Some eggs were found upright in the leaf close to the mid-rib and removed from the vein angles, while others were inserted in the base of the mid-rib, projecting parallel to the leaf surface. Most of them, however, were found in the vein angles in groups of two or three, each egg being more or less perpendicular to the leaf surfaces. Here they were partly hidden by pubescence, only the

black, conical tops being visible. Most of the eggs were found in the basal half of the leaf, and none at the tips where the veins were finer. The basal ends were inserted only slightly in the tissue, and each egg could be easily removed.

By the third week in June, a few second stage nymphs, many third and fourth, and a few fifth, were found. By the end of the first week in July, quite a few adults of the first brood were present together with many fifth stage nymphs. Eggs were deposited soon afterward in uninfested leaves, and during the last week in July first stage nymphs of a second brood were observed. During the last part of August and first part of September adults of a second brood appeared and later went into hibernation. Thus it is seen that there are two generations, each requiring about six weeks. On account of the extended oviposition period, it is possible at times to find all nymphal stages and adults and more or less overlapping of the broods takes place.

After hatching, the nymphs feed in colonies on the under leaf surface, causing a discoloration of the upper surface. In severe infestations, the leaves become yellow and dry, and many fall to the ground. The dorsal surfaces of all nymphs are covered with minute spines in addition to the larger tubercles and spines. As the nymphal stages advance, the insects tend to become broader and flatter; the lateral margins become flatter and more conspicuous, and the spines and hairs more pronounced.

*Egg*.—Length 0.51 mm. Greatest width 0.14 mm. Elongate oval, slightly curved when viewed laterally. Basal end rounded, gradually narrowing to distal end, which is covered with a conical cap, below which is a constriction. Widest at basal third. Basal one-half to one-third translucent, remainder dark brown to black.

*First Nymphal Stage*.—Length 0.5 mm. Greatest width exclusive of spines 0.2 mm. Broadly elliptical. General colour brown, lightest at posterior end of thorax and anterior end of abdomen. Fine median dorsal line beginning on head and extending through the second abdominal segment. A single broad, dorsal light band extending from head to posterior end of abdomen. Entire dorsal surface covered with minute spines. Eyes not

prominent consisting of a group of five ommatidia. Antennæ one-fourth to one-third the length of the body, translucent, bearing several hairs. Head with two minute tubercles on front each bearing a hair, a divided tubercle on vertex bearing two fine hairs and a pair of tubercles on dorsum each bearing a hair on tip and another one posterior. A pair of median tubercles on mesothorax each bearing a hair. A pair of median tubercles on second abdominal segment each bearing a hair. A pair of more prominent median tubercles on the 5th, 6th, 8th and 9th abdominal segments each bearing a single spine-like hair on the tip. Tubercles on the 5th, 6th and 8th abdominal segments also bear two longer spine-like hairs anterior to spine-like hair at tip. A single lateral spine-like hair arising from tuberculate base on pro- and mesothorax, and all abdominal segments beginning with the second. Ventral surface light; rostrum translucent, one-half the length of the body; legs translucent tinged with brown, tarsi tipped with pair of claws.

*Second Nymphal Stage.*—Length 0.75 mm. Greatest width exclusive of spines 0.4 mm. Narrowly oval to broadly elliptical, posterior end obtusely round, sides margined. Colour brown, light median dorsal line beginning on head and extending through the pro- and mesothorax broadening into a central dorsal light spot on the metathorax and the first and second abdominal segments. Dorsal armature similar to that of the first stage but more pronounced, lateral spine-like hairs becoming spines. Each lateral spine on the pro- and mesothorax has a minute spine posterior to it. Antennæ and eyes similar to those of first stage. Median portion of ventral surface light; beak translucent, one-half the length of the body. Legs similar to those of first stage.

*Third Nymphal Stage.*—Length 1.0 mm. Greatest width exclusive of spines 0.52 mm. Broadly oval, obtusely rounded at posterior end. Colour similar to that of preceding stage but somewhat darker. Lateral margins of 1st and 2nd abdominal segments light. Dorsal armature somewhat similar to that of proceding stage but more prominent. Lateral tubercles of pro- and mesothorax each bearing a prominent spine and four minute spines surrounding it. Lateral tubercles of abdomen more pronounced.

each bearing a hair on inner side. Legs, antennæ and rostrum white tinged with brown, otherwise similar to those of preceding stage.

*Fourth Nymphal Stage.*—Length 1.31 mm. Greatest width exclusive of spines 0.71 mm. Shape oval. Colour dark brown, fine V-shaped light line on median dorsal surface of head, connected with fine median dorsal line extending through the prothorax and broadening to a light spot extending to posterior margin of 2nd abdominal segment. Lateral posterior margin of prothorax and lateral margins of first three abdominal segments light. A small, light, dorsal median spot on 8th abdominal segment. Lateral tubercles and all spines light. Antennæ, legs, rostrum and median portion of ventral surface light. Lateral margins of pro- and mesothorax lobed. Lobes of mesothorax extending beyond posterior margin of first abdominal segment. Head with pair of spines on front, tubercle on vertex bearing a pair of spines with a smaller one anteriorly and posteriorly, pair of tubercles on dorsal surface bearing one prominent and five smaller spines. Prothorax bearing a pair of dorsal median spines and a smaller pair posterior to them. Mesothorax bearing pair dorsal tubercles each bearing a spine and posterior to the spine two hairs and a smaller spine. Other tubercles and spines of dorsal surface similar to but more pronounced than those of preceding stage. Prothorax with two minute and one larger spine on anterior lateral margin and one large and three smaller spines on outer angle of lobe. Tubercle on lateral margin of mesothorax bearing three spines and two hairs and anterior to tubercle are two spines on the lateral margin. Lateral margins of abdominal segments beginning with the second, each bearing a spine on tuberculate base and an inner side of each spine, a hair. Beginning with the fourth abdominal segment, there is an additional spine below each lateral spine. Antennæ one-third to one-half the length of the body. Rostrum extending to abdomen.

*Fifth Nymphal Stage.*—Length 1.9 mm. Greatest width exclusive of spines 1.2 mm. Broadly oval, sides flattened. Colour dark brown except following portions which are light; legs, antennæ, rostrum, majority of spines and tubercles, fine V-shaped

line on dorsal portion of head connecting with fine median line extending to posterior portion of prothorax where it connects with a subquadrate spot, lateral posterior margins of prothorax, central portion of metathorax between tubercles, posterior half of mesothoracic lobes, lateral margins of 6th, 7th and 8th abdominal segments, dorsal median spots on 6th, 7th, 8th and 9th abdominal segments, 1st, 2nd and most of 3rd abdominal segments. Ventral surface dark brown except light median band extending from front of head to 8th abdominal segment and the 1st, 2nd and outer portion of the 3rd abdominal segments which are also light. Lobes of mesothorax extending to 5th abdominal segments, sides of lobes somewhat angulated. Head with a pair of elongate spines on front, a tubercle on vertex bearing a pair of elongate spines and a short one anterior and posterior to this pair, a pair of elongate tubercles on dorsum of head, each bearing six elongate spines of varying lengths. Prothorax with sides broadly lobed, four spines in centre arising from a tuberculate base and a pair of smaller spines arising from a posterior light area, anterior margins of prothoracic lobes bearing three short spines, posterior to these arises a long one, posterior to this long one, there is another of similar length, on lateral posterior angle of lobe is a tubercle bearing five spines of varying length and a short hair interiorly. Mesothorax with a pair of dorsal tubercles on either side of light area each bearing three spines, lateral margin bearing two spines on outer angle of lobe and two minute ones posterior to these; posterior to the two minute ones there is a tubercle bearing three or four spines. Second abdominal segment bears a pair of median dorsal spines. Fifth, 6th, 8th and 9th abdominal segments each bear a pair of median, dorsal tubercles from each of which arises a single spine with two hairs anterior to it. Lateral margins of abdominal segments four to eight bear a single tuberculate spine from base of which arises two smaller spines and a hair. Eyes prominent, consisting of a number of ommatidia. Antennæ four-jointed, sides parallel, apical joint slightly clavate, second joint two-thirds the length of the first, third joint three times the combined lengths of the first and second, fourth joint slightly longer than the first and second combined. Two apical joints bearing several long

hairs. Legs somewhat hairy, tarsi bearing two strongly curved claws. Rostrum extending to metathoracic segment.

*Adult.*—Length 4 mm., width 2.3 mm. This was described by Gibson as mentioned in the first part of this account. Gibson states in discussing *C. juglandis*, which is also found on walnut, that both *juglandis* and *parshleyi* occur in the type series of *juglandis* in the Fitch collection, and that this probably accounts for the more or less vague conception of *juglandis* Fitch. He states that *juglandis* is somewhat smaller than *parshleyi* and has the apical band straight across the elytra, while in *parshleyi*, the apical band runs obliquely from the costal margin toward the inner margin of elytra and is narrower. Gibson also states that *juglandis* Fitch occurs throughout New England and south and west to Kansas and Texas, its food plants including walnut, butternut and linden. This means that it undoubtedly occurs in New Jersey, but up to the present we have not been successful in locating any species other than *parshleyi* on walnut.

## THE VARIETIES OF THE DRAGONFLY, *AGRION ÆQUABILE* (SAY).

BY CLARENCE HAMILTON KENNEDY, CORNELL UNIVERSITY, ITHACA, N.Y.

This living jewel with its metallic green body and crystal wings tipped with jet, flutters before the collector through the shadows of wooded streams from Maine to California, while its awkward nymph may be found crawling through the dense mats of willow and alder roots that hang in the woodland pools. Because of this timid and weak flight of *æquabile* as well as the rather special environment preferred by the nymphs, this species is seldom continuously spread in any region but is met on those occasional streams, which furnish its special requirements in patchy light, and root masses hanging in fairly clear water. As a result of this low ability to spread and the distance between broods because of the special environment required, this species has developed several marked varieties.*

By reference to the plate the reader can see at once the dif-

*This same tendency to the development of varieties in the weak-flying Agrionine dragonflies is discussed by MacLachlan, "Notes on Odonata collected by Buckley in Ecuador," Trans. Ent. Soc. Lond., 1881, p. 25

ference between these varieties, as all the figures are from the types except those for var. *æquabile*, which are from material in the Cornell collection and those of var. *yakima*, which are drawn from material collected by the writer in the type locality. All of these varieties undoubtedly intergrade because intergradations were found between var. *yakima* and var. *californicum*, and in a letter to Mr. Williamson, Dr. E. M. Walker states that such intergradations exist between var. *æquabile* and var. *hudsonicum*. The figures show that the five varieties can be grouped into two groups by the extent of colour on the male fore wing. Varieties *æquabile*, *coloradicum* and *hudsonicum* have the black of the front wing covering half the distance or less from the nodus to the tip. These are species of the eastern United States. Varieties *yakima* and *californicum* have the black of the front wings extending over more than half the space between the wing tip and the nodus. These are Pacific Coast forms.

Because of the plate, keys are unnecessary, and further notes are given under each variety heading.

**Agrion æquabile æquabile** (Say).

Jour. Acad. Phila., 8, p. 33, 1839. (Calopteryx).

♂ and ♀ types in the Mus. Bost. Soc. Nat. Hist.

The writer has not seen these types so the authority for their location is Muttkowski's Catalogue. This is the widely distributed eastern form that ranges across the northern states from Maine to Iowa. Probably it will be found even farther west in the Missouri River Valley. It has the least colour in its wings of any of the varieties excepting possibly *coloradicum*. It is found in all collections.

**Agrion æquabile coloradicum** Cockerell.

Psyche, 20, p. 173, 1913.

♂ type in the U. S. Nat. Mus.

The figures are drawn from the type. The female is unknown. This variety is from the high mountains of Colorado and differs from *æquabile* in having slightly more colour in the wings. It is the least distinct of the series of varieties. In the U. S. Nat. Mus. collection is a specimen from Ft. Collins, Colorado, identified by Dr. Banks as *hudsonicum*. I am inclined to call this *coloradicum*,

though it has more colour in the front wing than the type Probably a good series would show that *coloradicum* and *hudsonicum* intergrade.

**Agrion æquabile hudsonicum** (Hagen).

Proc. Boston Soc. Nat. Hist., 18, p. 22, 1875.

♂ and ♀ types in the Mus. Comp. Zool., Cambridge, Mass.

The types plus the thorax and wings of a third specimen are all from Michipicoten, Lake Superior. These are the only specimens of this variety that the writer has found in United States collections. I think this has been taken recently by Dr. Walker. It is characterized by the combination of little colour in the front wing and much colour in the hind wing. As was stated at the beginning of the article, this is said by Dr. Walker to intergrade with var. *æquabile*.

**Agrion æquabile yakima** (Hagen).

Psyche, 5, p. 248, 1890.

♂ and ♀ types in the Mus. Comp. Zool., Cambridge, Mass.

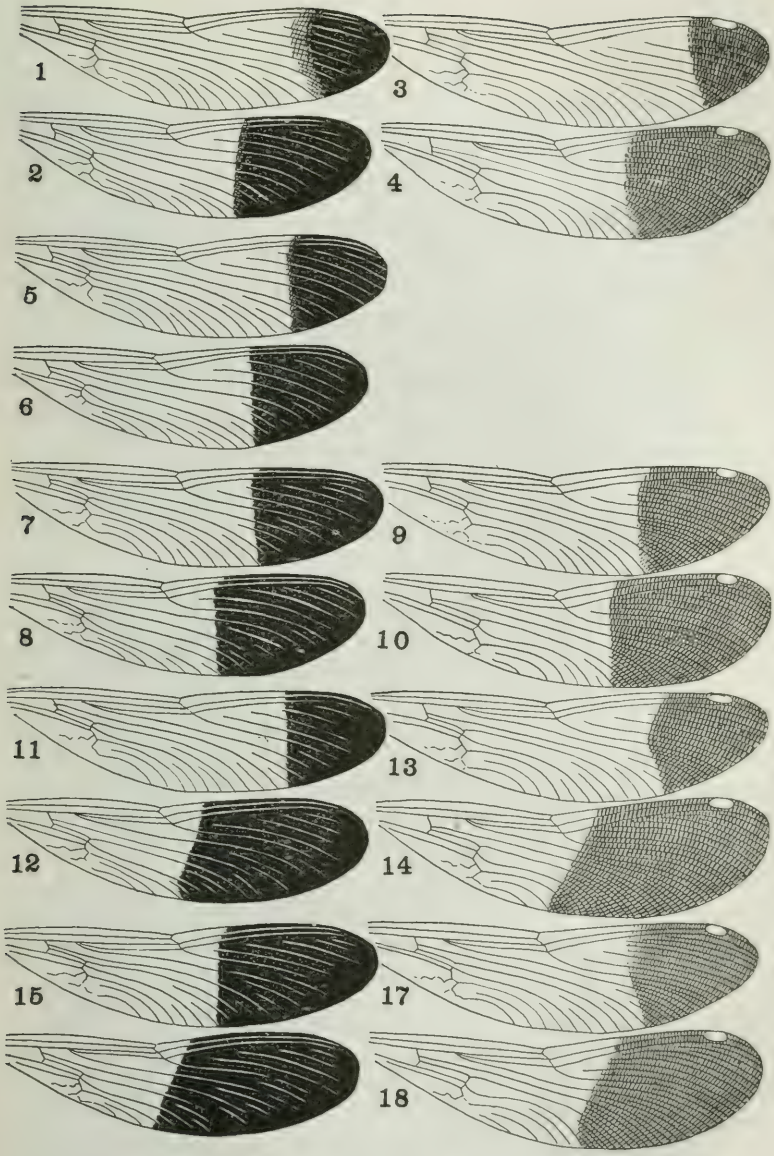
Dr. Banks kindly re-examined the types of this species for the writer and states that in the male the black in the front wing reaches barely more than half the distance from the tip to the nodus, and in the hind wing about two-thirds of the distance. While the types are from the Yakima River, (Wash.), this is the variety distributed through the Columbia River Valley. It has been recorded from Montana, (Elrod; Sci. Bull. Univ. Mont., p. 150-151, 1902), but the writer has seen none of the Montana specimens. A single male specimen is in the Cornell collection from Corvallis, Oregon. This is on the Willamette River, west of the main range of the Cascade Mountains, and, therefore, outside of the main Columbia River Valley, though the Willamette is a tributary of the Columbia. This variety intergrades with the next as is discussed in the succeeding section.

**Agrion æquabile californicum** Kennedy.

Proc. U. S. Nat. Mus., 52, p. 483-484, 1917.

♂ and ♀ types in the U. S. Nat. Mus., Washington, D. C.

This form has the most colour on its wings of any of the varieties of *æquabile*. The hind wing is as extensively coloured as in *hudsonicum*, and the front wing has the colour extending more than half way from the tip to the nodus. It is known from the




VARIETIES OF AGRION ÆQUABILE SAY.

types from the collection of Mr. and Mrs. Reynolds. The specimens were caught by Mr. Nunenmacher at Blue Lake, Humboldt Co., California. Other slightly less typical specimens are in Dr. Calvert's collection from Seattle, Washington. This variety is probably a member of the fauna of the narrow, very humid coast strip extending from northern California to southern Alaska. Various other species have dark forms in this humid belt. In the collection of the U. S. Biological Survey in Washington, D. C., are a male and a female *Agrion æquabile* collected on the Owyhee River, at Rome, Malheur Co., Oregon, which are intermediate between var. *yakima* and var. *californicum*. These are from southeastern Oregon. The writer had thought at first that the var. *californicum* might be a Pacific Coast extension of var. *hudsonicum*, but since the Malheur Co., Oregon, specimens have come to light it seems more closely related to var. *yakima*.

EXPLANATION OF PLATE XII.

Figs. 1–4. *Agrion æquabile æquabile*, specimens in the Cornell collection from Orono, Maine. 1–2 male, 3–4 female.

Figs. 5–6. *Agrion æquabile coloradicum*, male type in the U. S. National Museum. Female unknown.

Figs. 7–10. *Agrion æquabile yakima*, specimens in the writer's collection from Satus Creek, Yakima Co., Washington. 7–8 male, 9–10 female.

Figs. 11–14. *Agrion æquabile hudsonicum*, types in the Museum of Comparative Zoology, Cambridge, Mass., from Michipicoten, Lake Superior. 11–12 male, 13–14 female.

Figs. 15–18. *Agrion æquabile californicum*, types in the U. S. National Museum from Humboldt Co., California. 15–16 male, 17–18 female.

## NOTE ON AGRION ÆQUABILE HUDSONICUM (HAGEN).

Mr. Kennedy has asked me to add any remarks to his paper on *Agrion æquabile* that I might think desirable. I have only the following note to make concerning the race *hudsonicum*.

I have four much broken males of *A. æquabile* from the Kenogami River, Ont., on the Hudson Bay slope, north of Lake Superior, taken by Mr. W. J. Wilson in 1904. They were all taken within

3 miles of the mouth of the Flint River. Two of them are dated July 9, another July 8, the fourth, August 8. This last specimen is peculiar in having only the front wings darkened apically, though quite mature. The others are all of the race *hudsonicum*, although one of them approaches the race *æquabile* slightly in having a little less black on the hind wings.

I have also a series from several parts of Algonquin Park, Ont., which is on the edge of the Canadian Zone. Some of these specimens are typical *hudsonicum*, and on the whole they are quite similar to the Kenogami River specimens. Another series, taken at Kitchener, Ont., (formerly Berlin), by W. J. Fraser have, on an average, slightly less black on the apices of the wings than the Algonquin Park specimens. Some of these are typical *æquabile* except that the black area of the front wings is perhaps a little smaller, while others are nearer *hudsonicum* and cannot be distinguished from Algonquin Park specimens.

*Hudsonicum* tends to be a larger, stouter race than *æquabile*.

E. M. WALKER.

## NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART VI.

BY CHARLES P. ALEXANDER, LAWRENCE, KANS.

(Continued from Page 386.)

**Tipula kansensis,** new species.

Coloration pale brownish yellow; the mesonotal præscutum with five narrow, dark brown lines; antennal flagellum dark brown; wings with a white and brown picture on a pale brownish gray ground; male hypopygium with the ninth tergite small, deeply impressed medially to form two tumid halves: ninth pleurite produced into a flattened, chitinized lobe that is truncated apically; two pendulous, fleshy lobes in the notch of the ninth sternite.

*Male.*—Length 17 mm.; wing 15.3 mm.

Frontal prolongation of the head long, grayish brown; nasus indistinct; palpi with the three basal segments brownish yellow, the terminal segment dark brown. Antennæ rather short, the first three segments brownish yellow, the flagellum dark brown; the basal enlargements of the segments a little darker. Head grayish brown, with a distinct impressed median line.

Mesonotal præscutum brownish yellow, the usual stripes

represented only by dark brown margins, there being five such narrow lines, of which the lateral ones are broadest; remainder of the mesonotum grayish yellow, with numerous black setigerous punctures. Pleura yellow, sparsely gray pruinose. Halteres short, yellow, the knob, except at the tip, dark brown. Legs with the coxæ and trochanters yellow; femora dull yellow, the tips indistinctly brown; tibiæ brownish yellow; tarsi similar, the terminal segments darker. Wings mottled with brownish gray and whitish; costal cell yellow; subcostal cell similar but even more intense; stigma yellowish brown; membrane brownish gray, with darker spots at the origin of the sector and along the cord; large whitish areas along the cord extending from *R* through cell $Cu^1$ to the wing margin; a pale area beyond the stigma in cell *2nd* $R^1$ and the base of $R^2$; cell $M^1$ largely pale; two large, pale areas in the first anal cell. Venation: $R^2$ long, a little longer than the petiole of cell $M^1$; cell *1st* $M^2$ small, the punctiform *m-cu* inserted at about one-third to one-fourth its length.

Abdominal tergites brownish yellow, becoming darker near the hypopygium; an indistinct, interrupted, brown sublateral stripe; basal segments broadly ringed with silvery; sternites brownish yellow. Male hypopygium rather large. Ninth tergite small, deeply impressed dorso-medially to form two tumid halves; caudal margin flattened, with a deep, V-shaped median notch, the adjacent lobes subacute, reddish, each with a small, U-shaped lateral notch. Ninth pleurite incomplete, the pleural suture deep, the dorsal posterior margin of the pleurite produced dorsad into a flattened, chitinized margin that is truncated apically; outer pleural appendage small, slender, cylindrical. Dorsal inner angle of the ninth sternite with two pendulous, fleshy lobes hanging in the notch of the sternite, these tumid and clothed with abundant long, pale hairs; eighth sternite large, the caudal margin almost straight medially, with a broad fringe of long yellow hairs; the lateral lobes produced.

*Habitat.*—Kansas.

*Holotype.*—♂, Lawrence, Douglas County, Kansas, June 4, 1918.

**Tipula alaska,** new species.

Antennæ with the flagellum uniformly pale brown; meso-

notum dull yellow, the præscutum with three brown stripes; wings subhyaline or with a very indistinct pattern; abdomen yellow, trivittate with reddish brown; male hypopygium with the ninth tergite large, flattened, narrowed posteriorly and with a very deep median notch.

*Male.*—Length 17 mm.; wing 17.7 mm.

*Female.*—Length 20 mm.; wing 17.5 mm.

Frontal prolongation of the head moderately elongated, dull brownish yellow, the nasus very small. Antennæ of the male moderately elongated, the scape yellow, the flagellar segments uniformly pale brown; basal swelling of the flagellar segments not conspicuous. Head brownish yellow.

Thoracic dorsum dull yellow, the mesonotal præscutum with three dark brown stripes, the median one a little paler and bisected behind, the lateral stripes continued backward on to the scutal lobes; scutellum dark brown, more yellowish laterally; postnotum dull yellow medially, brown on the sides; a delicate capillary brown line extends from the præscutum backward to the base of the abdomen. Pleura dull yellow, the mesosternum and the mesepisternites brown. Halteres pale, the knobs, except the tips, paler. Legs with the coxæ dull yellow, the cephalic face of each more brownish; trochanters dull yellow; femora yellow, the tips broadly dark brown; tibiæ and tarsi similar, the tips of the individual segments narrowly darker. Wings grayish, the stigma more yellowish brown outwardly; a broad obliterative streak along the cord continued into the base of cell $M^4$. Venation: basal deflection of $R^{4-5}$ short or punctiform; basal deflection of $Cu^1$ from one-third to one-fourth the length of cell *1st* $M^2$.

Abdomen dull yellow, the segments narrowly ringed caudally with silvery; tergites beyond the base with a narrow, indistinct, reddish-brown stripe that is interrupted at the posterior margins of the segments; lateral margins of the segments with a conspicuous triangular reddish-brown blotch; basal sternites yellowish, terminal sternites darker coloured. Male hypopygium moderately enlarged. Ninth tergite large, flattened, narrowed posteriorly, with a very deep median notch, the lobes formed being elongate, flattened, a little divergent, the tips subacute; the tergite is dark brown on each side of the base, the apex yellowish. Ninth pleurite

incomplete, the suture well indicated beneath, the posterior margin of the pleurite produced caudad into a slender point; ventrad of the pleurite is a large, greenish, fleshy lobe; outer pleural appendage pale, rather small, club-shaped, the base constricted, the outer face with long, scattered hairs. What appears to be the gonapophyses of the penis-guard project caudad as two acute chitinized points. Eighth sternite rather large, the caudal margin pale, the median area flattened, transverse, finely fringed with reddish hairs, the lateral angles produced caudad and provided with a few strong, decussate bristles and a few smaller hairs. Female ovipositor with all the valves slender, subequal in length, the tips of the dorsal valves bluntly rounded.

*Habitat.*—Alaska.

*Holotype.*—♂, head of the Tsirku R., Alaska, July–August, 1910.

*Allotype.*—♀, with the type.

**Tipula flavibasis,** new species.

Size small (wing under 14 mm.); antennæ of the male elongated, bicolorous, the basal enlargement of each segment yellow, the remainder black; mesonotum yellowish brown without distinct stripes; wings with a strong gray tinge.

*Male.*—Length 11.5–12 mm.; wing 12.2–12.7 mm.; antennæ about 4.5–5 mm.

*Female.*—Length 16 mm.; wing 12.3–13.3 mm.

Frontal prolongation of the head yellowish brown; nasus not distinct. Palpi with the basal segments brown, pale at the joints, the terminal segments more yellowish. Antennæ of the male elongated, the scape dull yellow, the first flagellar segment pale yellowish brown on the basal half, dark brownish black on the apical half; remaining flagellar segments with the basal swelling yellow, the pedicel black. Head gray, the occiput more yellowish the inner margin of the eyes narrowly pale gray.

Mesonotum yellowish brown, the usual stripes poorly indicated Pleura yellow with a very sparse white bloom. Halteres pale, the knobs brown. Legs with the coxæ and trochanters light yellow, femora yellow, the tips narrowly dark brown; tibiæ similar, the tips indistinctly darker; tarsi brownish yellow, the apices of the segments slightly darkened. Wings with a strong gray tinge, the

costal and subcostal cells yellow; stigma dark brown; a brown mark at the arculus; veins dark brown; obliterative streak broad, extending into the base of cell $M^4$.

Abdomen with the tergites yellowish; a broad, dark brown median stripe that is interrupted at the posterior margins of the segments; a narrower sublateral stripe; sternites yellow. Male hypopygium moderately enlarged. Ninth tergite large, the caudal margin shiny with a very deep notch at the base of which is a small, acute median tooth; lateral angles prominent, flattened, subacute and slightly divergent at their apices. Ninth pleurite complete or practically so; outer pleural appendage small, cylindrical, covered with long, coarse hairs; inner pleural appendage complex, produced posteriorly into a pale, flattened, truncated lobe that is covered with abundant pale hairs, the anterior arm heavily chitinized, the tip bifid and jutting into the notch of the tergite. Ninth sternite with two pendulous lobes hanging in the notch, these lobes narrowed toward their outer ends. Eighth sternite with the posterior margin concave, the median portion with a dense, transverse fringe of long, yellow hairs, near each lateral angle with about two powerful decussate bristles. Penis-guard very elongate, the tip split into two hair-like points.

The female is similar to the male; antennæ short; abdomen with the dorso-median stripe lacking, the posterior margins of the segments broadly ringed with pale; ovipositor with the valves acute, compressed, the tergal valves longest, blackened at their tips.

*Habitat.*—Kansas.

*Holotype.* ♂, Lawrence, Douglas Co., Kans., July 1, 1918.

*Allotype.*— ♀, with the type.

*Paratopotypes.*—75 ♂'s ♀'s, June 28–July 3, 1918.

In the peculiar antennæ, this interesting species agrees with *T. tephrocephala* Lw., but in all other respects is a very different fly.

**Tipula flavo-umbrosa,** new species.

*Male.*—Length 22 mm.; wing 21.5–22 mm.

*Female.*—Length 21–22 mm.; wing 18 mm.

Very similar to *Tipula umbrosa* Lw. (*inermis* Doane) but larger than that species and much more yellow throughout. The

antennæ are more clearly bicolorous apically. Præscutal stripes orange instead of dark brown, the median pair narrow, widely divided by the ground-colour. Wings strongly tinged with yellow before the cord, the costal cells yellow instead of brown. Abdomen more yellowish, especially laterally. Male hypopygium with the median area of the eighth sternite with two broadly triangular teeth, the notch between them V-shaped or narrowly U-shaped. The female is similar to the male but somewhat smaller.

*Habitat.*—Central United States.

*Holotype.*—♂, Lawrence, Douglas Co., Kansas, June 6, 1918.

*Allotype.*—♀, with the type (M. M. Alexander).

*Paratopotypes.*—Several ♂ ♀.

I have examined the type of *umbrosa* at Cambridge, and have seen paratypes of *inermis*, and they both refer to the smaller dark-coloured species of this group. It is possible that still other species remain to be separated from this complex.

## SOME NEW OR SCARCE COLEOPTERA FROM WESTERN AND SOUTHERN FLORIDA.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

Between December 1, 1917, and April 1, 1918, the writer was in Florida and collected Coleoptera and Orthoptera for much of the time. The most of the collecting was done about Dunedin,* a town in Pinellas County on the west coast, but in late February and early March a trip was taken to the Lake Okeechobee region, during which several days' collecting was done at each of the following places: Lakeland, Ft. Myers, LaBelle, Moore Haven** and Okeechobee City. One day was also spent on the east shore of Lake Okeechobee at the point where the Palm Beach Canal leaves the lake. The species of Coleoptera herein noted, on account of their apparent scarcity in the State, or which are regarded as undescribed forms, were for the most part taken during the winter at some one or more of the places above mentioned.

*See Canadian Entomologist, 1917, 137.

**This is a new town on the west side of Lake Okeechobee, at the point where the Caloosahatchie River formerly emerged from the lake. A large area of the old lake area southeast of the town has been drained and is now under cultivation.

**Loxandrus brunneus,** sp. nov.—Elongate-oval. Above nearly uniform dark reddish brown, strongly shining; head and last ventral segment often piceous brown. Under surface pale chestnut brown; legs, mouth-parts and three basal joints of antennæ brownish yellow, outer pubescent joints of antennæ darker. Head longer than broad, eyes prominent. Thorax slightly wider than long, sides broadly and evenly curved from base to apex; front and hind angles slightly obtusely angulate; disk smooth, its sides in front of middle declivent; median and apical impressed lines fine, entire; basal impressions linear, deep. Elytra iridescent, two and one-fourth times as long as thorax, one-fifth wider at base; sides subparallel from behind humeri to apical third, then rounded and converging to apex; striæ rather deep, their inner margin very finely crenate-punctate; intervals smooth, feebly convex, the third with the usual dorsal puncture of the genus. Length 6.3—6.8 mm.

This species differs from all others of its approximate size except *crenatus* in its usually uniform shining brown colour. This is not due to immaturity, as numerous specimens, all of the same hue, have been taken. It was frequent beneath the wash-up on the shore of Lake Okeechobee, four miles southeast of Moore Haven, March 1–3, and when uncovered ran very swiftly to the nearest shelter. It was also taken at LaBelle and has been in the writer's collection undetermined since 1911, when specimens were secured about the margins of ponds and bay-heads at Sarasota. Specimens sent to the late Frederick Blanchard were returned as unknown to him, and H. P. Loding, of Mobile, Alabama, who has a large collection of southern forms of the genus, says he has nothing like it.

**Loxandrus saphyrinus** Chaud.—Leng, in his "Carabidæ of Florida,"* seems to doubt both the validity of this species and its occurrence in Florida. A specimen taken at Sanford, March 28, runs only to *saphyrinus* by Le Conte's tables, and is very distinct from *reflexus* Lec. of which Leng considers it a synonym, being slightly larger, with thorax less transverse, its sides more rounded, elytral striæ more coarsely punctate and surface with iridescence much stronger, being more brilliant than in any species of the genus known to me. Chaudoir's type of *saphyrinus* was from

*Bull. Am. Mus., Nat. Hist., XXXIV, 1915, 579.

Louisiana, and there is, therefore, no reason why it should not occur in Florida.

**Loxandrus flavilimbus,** sp. nov.—Elongate-oval. Above dark reddish or chestnut brown, strongly shining, the side margins and hind angles of thorax, and the basal three-fourths of side margins of elytra dull red; mouth-parts, legs and under surface pale reddish brown; apical two-thirds of antennæ fuscous. Head as broad as long; eyes large, feebly convex. Thorax subquadrate, disk smooth, sides broadly but evidently curved, front angles obtuse, hind ones broadly rounded into base; median line very faint, basal impressions shallow, shorter than usual. Elytra as wide at base as thorax, slightly more than twice as long; humeri feebly curved, sides behind them almost straight for three-fourths their length, then rounded and sinuate to apex; striæ shallow, their punctures rather coarse, close-set, faint or subobsolete on apical third; intervals smooth, very feebly convex. Length 10 mm.

Beneath board near border of pond north of Dunedin; Jan. 1, rare. Loding (Ms.) says he has an unnamed specimen which he considers identical. The size, pale legs, pale margin of thorax and elytra and coarsely punctured striæ preclude it from being any of the species treated in LeConte's tables. Two or three other species or forms of *Loxandrus* are at hand which cannot be placed by his tables. The genus, as represented in Florida, is one of the largest of the Carabidæ, but is badly in need of revision.

**Lebia abdominalis** Chaud.—This is recorded only from Enterprise and the Biscayne Bay region. A half dozen were found beneath the debris on the shore of Lake Okeechobee, near Moore Haven, and one was beaten from oak at Lakeland.

**Lebia furcata** Lec.—A single specimen, the first I have taken in Florida, was beaten Dec. 17 from the dead leaves of a cabbage palmetto near Dunedin. It is listed as rare at Tampa, Crescent City and Gainesville.

**Plochionus amandus** Newm.—A male, typically coloured, as described by Horn,* was beaten from a mass of Spanish moss on the margin of Skinner's Hammock, north of Dunedin, Feb. 11. From the descriptions I judge that *amandus* is only a colour form

*Trans. Am. Ent. Soc., X, 1882, 146.

of *discoideus* Schaupp.† Horn (loc. cit.) records one specimen from Florida.

**Onota floridana** Horn.—One specimen was beaten from oak at La Belle on Feb. 26. It is a scarce Floridian species, hitherto recorded from Lake Poinsett, Haw Creek, Enterprise and Biscayne Bay.

**Selenophorus chokoloskei** Leng.—I find two specimens of this new form among my series of *S. palliatus*. They are labeled Dunedin, March 25, 1915. It was described from Chokoloskee and Everglade.

**Selenophorus depressulus** Casey.—This is undoubtedly distinct from *S. iripennis* Say, and seems to be more common in southern Florida than the latter, the specimens at hand being from Sanford, Lake Istokpoga, Ft. Myers and Dunedin, the dates ranging between Dec. 30 and March 26. It occurs beneath cover, usually in rather dry spots, about the borders of gardens and cultivated fields. From *iripennis* it may be easily separated by its wider thorax which is less narrowed basally, its hind angles broadly rounded instead of obtuse and basal depressions more finely and densely punctate. Both species have the dorsal series of punctures, characteristic of the genus, very small and they are, therefore, apt to be confused with species of *Stenolophus*.

**Stenolophus carbonarius** Dej.—A single specimen was taken from beneath the beach debris southeast of Moore Haven on March 1. It differs from Indiana examples only in having the sutural striæ one-third shorter. Not before recorded from Florida, though LeConte* gives the range as "Middle and Southern States."

**Olla oculata sobrina** Casey.—This form was described from Florida without definite locality. Schwarz (Ms.)** has noted it from Jacksonville. Specimens at hand are from that place, Gainesville, Sanford, Dunedin and Ft. Myers, all taken between Feb. 24 and April 24. About Dunedin it apparently hibernates

†Bull. Brk. Ent. Soc., II, 1886, 86.

*Bull. Brook. Ent. Soc., VI, 1883, 14.

**The Schwarz (Ms.), referred to frequently in this paper, is an annotated copy of his "Coleoptera of Florida," in which all additional species of Florida Coleoptera taken by himself and others, up to within the last few years, are carefully recorded, with localities, dates, etc. Through the kindness of Mr. Schwarz I was able to borrow this annotated list from the Smithsonian Library and made a copy of all the manuscript additions and records.

in bunches of Spanish moss, but has been taken also from oak and plum trees.

**Psyllobora parvinotata** Casey.—Several specimens taken by beating on Hog Island. A submaritime species known from Haulover, Palm Beach and Key West. Distinguished by its lack of antescutellar spot of pronotum and small, isolated, drab spots of elytra, the general colour also paler than in *20-maculata*. Leng regards it as only a variety.

**Psyllobora pallidicola** Blatch.—This small Coccinellid was described* as a variety of *P. 20-maculata*, but further study of its habits and characters led me to believe it a valid species. It is always smaller, non-alutaceous and wholly without spots on thorax. As. P. N. Timberlake, Entomologist of the Hawaiian Sugar Planters' Experiment Station at Honolulu, was studying the male genitalia of Coccinellidæ, I sent him specimens of *pallidicola* for examination. Under date of Dec. 7, 1917, he wrote: "At your request I have compared the male genitalia of your *Psyllobora pallidicola* with *20-maculata* and have found considerable differences, the principal one of which resides in the length of the ædeagus. In *pallidicola* the ædeagus is very short compared with *20-maculata*, in which species it is drawn out like a whiplash. *P. tædata* Lec. and *borealis* Casey, are similar if not identical with *20-maculata* in this respect, and I doubt whether they are anything more than geographical variants. *P. pallidicola*, however, is undoubtedly distinct."

About Dunedin *P. pallidicola* occurs frequently throughout the winter on oak and wax myrtle, but is never taken with *20-maculata* which is there a scarce species. The former has also been taken at Lakeland, Ft. Myers and La Belle, and is probably widely distributed throughout central and southern Florida, and north at least as far as Ormond.

**Hyperaspis nigrosuturalis,** sp. nov.—Broadly oval or subhemispherical, convex. Black, shining; front of head, apical angles and side margins of thorax to behind middle, yellow. Elytra red, their basal sixth, a very narrow margin and wider sutural stripe, black; the sides of the red disk connected just behind the scutellum, the sutural stripe being incomplete. Sides of ventral

*Can. Ent., 1914, 66.

segments tinged with reddish. Tarsi brownish fuscous. Upper surface distinctly and rather coarsely punctuate, the punctures separated by more than their own diameters; under surface more coarsely and shallowly punctate. Length 3 mm.

One specimen beaten from bunch of Spanish moss near the margin of a lake north of Lakeland, Feb. 22. Differs in colour from any described form. Closely related to *H. tædata* Lec. and *regalis* Casey.

**Scymnus bigemmeus** Horn.—Taken on Hog Island Jan. 20 and Feb. 9 by beating vegetation just back of the skirting fringe of mangrove, *Rhizophora mangle* L. Described in 1895 from Punta Gorda and Biscayne Bay, and since recorded only from Miami.

* * * * * * * * * * * * * * * * * * * * *

Near the top of page 445 of Schwarz's "Coleoptera of Florida"* is the following: "*Anamorphus pusillus* Zimm. ms. E. rare with the preceding." The preceding referred to is *Rhymbus ulkei* Cr., which Schwarz mentions as "E. (Enterprise) rare, lives on fungus which grows on dead branches." At the bottom of the page is a footnote by Le Conte as follows: "I have not described this genus (*Anamorphus*), as its affinities are not yet clearly made out. It is a small, rounded, testaceous, hairy insect having somewhat the aspect of *Rhymbus* but without prothoracic lines; the tarsi are not dilated. The specimens at my disposal are not sufficient for a thorough investigation." It will be noted that he does not refer to the specific name *pusillus*, but only to the genus *Anamorphus*.

In 1883** Le Conte & Horn diagnosed, and, therefore, first validated, the genus *Anamorphus* as follows: "Body hemispherical; tarsi narrow, 4-jointed; prothorax with large, finely margined, basal lobe, and a basal line each side, running forwards and then curving inwards; antennæ 9-jointed, club elongate, very loose."

Henshaw in his Check List (1885, p. 49) mentions *Anamorphus* Lec., but accredits no species whatever to it. In 1906 Dury † recorded *Anamorphus pusillus* Zimm. as occurring near Cincinnati,

*Proc. Amer. Phil. Soc., XVII, 1878.
**Classification Col. N. Amer., 120.
†Journ. Cinc. Soc. Nat. Hist., XX, 251.

O., and in 1910** the writer in a key gave a brief diagnosis of the genus, based on that of Le Conte and Horn, and added: "*Anamorphus pusillus* Zimm, pale reddish brown, length 1.5 mm.. has been taken by Dury near Cincinnati."

The above constitute all references which can be found in the literature available to either the genus *Anamorphus* or the species *pusillus*. Whether *pusillus* was sufficiently characterized, when it was assigned to a genus not then defined, and therefore invalid, and the species itself described only as a "small, rounded testaceous hairy insect, etc.," as set forth above, I leave for better nomenclatorial cranks than myself to settle.

A careful comparison shows that the specimen in the Dury collection differs sufficiently from two at hand from Florida to justify a new name, and as *pusillus* is known only from the description quoted, I give the principal characters of each as follows:

**Anamorphus pusillus** Lec.—Rounded-oval or semi-hemispherical, strongly convex. Dark reddish or chestnut brown, shining, rather thickly clothed with long, semi-erect, yellow hairs; legs and antennæ dull yellow. Eyes small, coarsely facetted, widely separated. Thorax twice as wide as long at middle, sides feebly curved, hind angles rectangular, disk minutely and sparsely punctate, each puncture bearing a very slender, yellow hair; basal lobe prominent, triangular, its apex rounded, the curved basal lines very fine. Elytra one-fifth wider than thorax, their common base widely and rather deeply emarginate to receive the basal thoracic lobe; umbones prominent; sides strongly declivent; disk with numerous scattered punctures, much coarser and more distinct than those of thorax, each bearing a longer, coarser, more erect yellow hair. Under surface smooth, polished. Length 1.2 mm.

Dunedin, Fla., March 27, 1916; March 23, 1918. Both were taken while beating in Skinner's Hammock, one mile northeast of Dunedin. One of the two has the head and apical third of elytra darker than the general hue. It is probably frequent in wet hammocks throughout the greater portion of Florida, but over-

**Coleoptera of Ind., 535.

looked on account of the small size. Schwarz (Ms.) lists it also from Crescent City, Fla.

**Anamorphus waltoni,** sp. nov.—Larger and broader than *pusillus*, the shape hemispherical rather than oval. Colour uniform pale reddish brown. Elytral punctures much finer and more dense than in *pusillus*, the pubescence therefore thicker and more evident. Characters otherwise much the same as those of *pusillus*. Length 1.6 mm.

Named in honour of L. B. Walton of Gambier, Ohio, the recognized American authority on the Endomychidae.

Dury's record, cited above, is as follows: "One specimen July 7, taken feeding on beech log in company with *Rhymbus minor*, which species it resembles in an astonishing manner."

**Nausibius repandus** Lec.—Listed by Schwarz as very rare under oak bark at Tampa. A single specimen was taken at Dunedin while sweeping huckleberry and other low shrubs on Jan. 29. It is a southern form, described from the District of Columbia, and appears to be everywhere very scarce.

**Ino reclusa** Lec.—A single specimen was beaten March 26 from the dead limbs of the Florida button-bush, a shrub resembling the black mangrove and growing just back of the borders of the latter near the middle of Hog Island. The beetle was described from Columbus, Texas, and has not before been recorded from Florida. It is one of the smallest (2 mm.) of Cucujids, pale brown with broad head, thorax triangular, wide in front, very narrow at base, and elytra covering only half of the abdomen.

**Catogenus rufus** Fab.—This widely distributed species has been recorded from several stations in Florida, though only six examples have been taken by me during seven winters' collecting. It is mentioned here only to make known its power of resisting cyanide fumes. On December 15 three were found beneath the bark of a pine log and placed with other specimens in a heavily charged cyanide bottle. Five hours later they were all alive and active, though everything else in the bottle had long before "passed on." I replaced them in the bottle and left them for 24 hours, when they, too, appeared to have succumbed. They were then put in a pill box with proper label and date, and I was much sur-

prised on opening this ten days later to find two of them alive and kicking. They were for a second time "gassed" for 24 hours, and then put back with their dead companions. Some two or three weeks later I found one of them was still in "status ante bellum," so I gave him a *week's* cyanide treatment, and he never "came to" thereafter. The bottle was in almost daily use until April 1, and killed quickly all other insects placed in it up to that date.

## RECENT CANADIAN PUBLICATIONS.

(Continued from Page 392)

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.—March, 1916. No. 8. Systematic Series. Victoria, 1918. 30 pp., 3 pls.

This report contains the following papers and addresses:—

*Presidential Address:* G. O. Day. Pp. 4–6.

*On the species of the genus Pero occurring in British Columbia:* E. H. Blackmore. Pp. 7–9 Contains remarks on the genus and descriptions of the four species known from British Columbia, with notes on their distribution.

*The occurrence of Glutops singularis Burgess in British Columbia:* R. C. Treherne. P. 10. Records the capture of this rare but widely distributed fly at Agassiz, B. C.

*An Appreciation:* A. F. Winn. Pp. 11–13. Conveys greetings from the Parent Society, with words of appreciation of the work of the B. C. Branch, and a plea for co-operation among the various branches of the Society.

*Furthur additions to the list of British Columbia Geometridæ:* E. H. Blackmore. Pp. 14–20. An annotated list of 23 species and varieties recorded for the first time from British Columbia, with synonymic notes on some of the forms. Ten species are illustrated from photographs.

*Larva Rearing:* G. O. Day. Pp. 21–27. Describes methods of collecting and rearing Lepidopterous larvæ; largely quoted from an article by E. Rippon, in *the Entomologist*, 1915.

*In Memoriam. Captain R. V. Hardy:* R. S. Sherman. Pp. 29–30, with portrait.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.—March, 1917. No. 10. Systematic Series. Victoria, 1918. 31 pp., 4 pls.

The following articles appear in this number:

*Presidential Address:* E. H. Blackmore. Pp. 4–10.

*Notes on the Lepidoptera of the Northern Okanagan:* W. D. Downes. Pp. 11–13. Notes on a small collection made by the writer in this district.

*Notes on the hibernation of some larvæ and the movement of Boreus on the snow:* J. Wm. Cockle. Pp. 14–15. *Boreus californicus* was observed to appear on the surface of the snow shortly after each fall. They come up through the snow, but do so gradually, following up each fall as it occurs, and always keeping as near the surface as the temperature will permit.

*Notes on Geometridæ new to British Columbia.*—E. H. Blackmore. Pp. 16–20. Six species and eight varieties new to British Columbia are recorded. Illustrated by two plates, the first showing varieties of *Xanthorhoe defensaria*, recently described by Mr. Swett, the second 8 other forms belonging to various genera.

*Fossil Insects, with special reference to those of the Tertiary Lake deposits of the Similkameen Valley, B.C.:* Alfred E. Cameron. Pp. 21–29. A brief sketch of the general subject of fossil insects, with notes on a collection of 73 specimens, made by Mr. L. M. Lambe, of the Dominion Geological Survey, in the Tertiary Lake deposits of the southern Interior of British Columbia. These were studied by Handlirsch, the eminent authority on fossil insects, and the results published in vol. II of the Contributions to Canadian Palæontology (Geol. Surv. Can., 1910). The collection is believed to be of early Tertiary age on account of the absence of many families not known before Cretaceous times and the presence of a relatively large number of Diptera, particularly of the Bibionid genus Penthetria, which at present is almost restricted to tropical and subtropical regions. A few other forms have a similar significance. The paper also contains a general account of the geological record of insects.

*In Memoriam. Tom Wilson:* R. C. Treherne. Pp. 30, 31; with portrait.

Report of the Provincial Museum of Natural History for the Year 1917.—Victoria, B.C., 1918. 35 pp.

*Entomology.* By E. H. Blackmore, (pp. 09 to 0 15, with 2 plates).

This paper contains notes on some of the injurious insects of the season; an account of a collecting trip for the Museum to the Lower Fraser Valley District; a list of 14 species of Odonata, recently identified for the Museum; notes on rarer insects, taken in the Province during 1917; and an annotated list of British Columbian Lepidoptera described during the same year. The paper is illustrated by two plates from photographs, the first showing Noctuidæ, the second Geometridæ.

*Economical Sprays and Spraying for 1918.* By. L. Cæsar, O. A. College, Guelph. Forty-ninth Annual Report Fruit Growers' Assoc. of Ont., 1917, (1917) pp. 20–25.

*Insects and Fungicides.* By L. Cæsar, O. A. C., Guelph. 13th Ann. Rep. Vegetable Growers' Assoc. of Ont., 1917 (1918), pp. 29–32.

In these two papers the various insecticides and fungicides on the market during the season of 1918 are discussed, their characteristics and relative merits given and the prices likely to prevail stated. In the first paper the question of the substitution of arsenate of lime for arsenate of lead is considered at some length, and on account of differences of opinion in different localities on this question, the author does not recommend the former as a general substitute for the latter, though he regards it as safer to use on apples just before the blossoms burst.

*The Protection of Plants.* By Georges Maheux. Bull. No. 42, Dept. Agric. Prov. Quebec. July, 1918. 30 pp. Published in English and French.

A brief and concise summary of methods for the control of injurious insects and plant diseases, illustrated by numerous text figures. The matter is arranged as follows:

I. Insects injurious to all crops. Under this heading the principal types of noxious insects are described, and the general methods of control outlined.

II. Insects injurious to vegetables. The various kinds of

vegetables are taken up in turn, their insect enemies and diseases enumerated and the remedies indicated.

III. Insects injurious to fruit trees. Following directions for the general treatment of the orchard, the different kinds of fruit trees are taken up as in section II.

IV. Insects and diseases injurious to fruit bushes.

V. Insects injurious to cereal crops.

VI. Sprays. The general principles governing the control of chewing, sucking and boring insects are outlined, followed by the descriptions of the composition and preparation of the chief insecticides and fungicides.

From Le Journal d'Agriculture. Vol. 21, 1918:—

*Defense de Culture.* By Geórges Maheux. No. 7, Jan., p. 110.

*Insects nuisibles au blé.* By Georges Maheux. No. 9, Mars., pp. 144.

*Le travail de la Section Entomologique.* By Georges Maheux. No. 10, Avril, p. 149.

From Le Naturaliste Canadien. Vol. 44:—

*Les Coleopteres du Canada.* By J. I. Beaulne. No. 7, Jan., pp. 110–111; No. 8, Feb., pp. 123–128; No. 9, Mars., pp. 159–160; No. 11, Mai, pp. 187–191:

These parts of this useful list, which was begun in vol. 10, No. 1, 1914, complete the Dytiscidæ and Gyrinidæ and include a portion of the Hydrophilidæ. The source of the original description and the distribution by provinces is given for each species.

*Une nombreuse posterité. Le puceron de la rudbeckie (Golden Glow aphis) Aphis rudbeckiæ Fish.* By P. Fontanel, S. J. No. 8, Feb., pp. 115–123; No. 9, Mars, pp. 142–144; No. 10, Avril, pp. 157–159.

Describes various features of the life cycle of this aphid and makes a number of calculations based on the theoretical rate of reproduction of the species.

*Notes concernant l'Hemerocampe marquée de blanc.* By J. C. Chapais. No. 11, Mai, pp. 163–166. 4 figs.

A brief description of the life-history and methods of control of the White-marked Tussock Moth.

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| TOWNSEND, C. H. T. | U. S. Bureau of Entomology | WASHINGTON, D.C. |
| TREHERNE, R. C. | Dominion Entomological Service | VANCOUVER, B.C. |
| WALKER, PROF. E. M. | University of Toronto | TORONTO, ONT. |
| WEISS, H.B. | New Jersey Agricultural College | NEW BRUNSWICK, N.J. |
| WELD, L. H. | | EVANSTON, ILL. |
| WHITEHOUSE, F.C. | | RED DEER, ALTA. |
| WILSON, H. F. | University of Wisconsin | MADISON, WIS. |
| WINN, A. F. | | WESTMOUNT, QUE. |

# The Canadian Entomologist

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## A BREATHING SPELL.

Full fifty years of seasons fleet
Give pause to round another bend,
A rallying-place for friends to greet
Ere onward once again we wend.

* * * * *

I.

A gallant flood of noble sweep
Our stream holds bravely on its course,
With sparkling face and limpid deep
That draw from rills beside the source.

A varied scene its banks display
In wood and swamp and far ravine;
By mill and farm it makes its way,
By garden-plot and pasture green.

All honour then to those before
Who pointed first the distant goal;
From hill to vale who steadfast bore
To trace the course our waters roll.

With outlook wide, from upland slope,
Our fathers viewed all Nature's ground;
We strive within a smaller scope
To perfect out our little round.

II.

Children at play upon the shore
Of a mysterious, murmuring sea—
But gathered shells is all our lore,
The vaunt of poor humanity.

'Mid doubt and error on we go,
By glimmering star a path we steer;
To seek the truth but not to know,
The lot of all who voyage here.

We have our moments rich and rare;
Amid long hours of darkest night,
When on our vision bursts the glare
Of meteor's trail or Northern Light;

Till comes with dawn the lookout's call,
Strange ships beat up by wind and lee.
In one great quest adventurers all
We sail no more a lonely sea.

III.

Within the heart's all-cherished shrine
Of talents manifold are three
That Nature's mysteries best divine—
Love, Reverence, and Humility.

In earnest work, in eager play,
By Nature-love united all,
With might and main do what we may,
Nor boast the great, nor scorn the small.

"So much to do, so little done"
Each lonely labourer's parting sigh,
Then speed the work so well begun,
The common purpose cannot die.

Each has his place within the plan,
His proper place none else may fill;
In brotherhood our course began,
By brotherhood is furthered still.

* * * * *

Then onward once again we wend
From rallying-place for friends to greet,
From pause to round another bend
And fifty years of seasons fleet.

FRANK MORRIS

Peterborough, Dec., 1918.

## OUR NEW VOLUME.

With the completion of the fiftieth volume of *The Canadian Entomologist*, a convenient opportunity arises for the introduction of any new features or changes that may seem desirable.

For fifty years the size of our page has never varied, a fact which says much for its suitability; but the time has now come when a larger page presents certain advantages, particularly with regard to illustrations. It was accordingly decided at the recent Annual Meeting of our Society to adopt the present size, which is uniform with that of our Annual Report and the Ontario Government bulletins, and is more suitable for full-page illustrations, besides permitting a freer interchange of these with other publications.

This will bring about a considerable reduction in the number of pages, but there will be no material change in the quantity of matter in the text.

The June and July numbers will be issued together and likewise the August and September numbers, so that there will be only ten issues, instead of twelve, two of these being of double size.

## POPULAR AND PRACTICAL ENTOMOLOGY.

### The Apple Maggot in British Columbia.*

BY W. DOWNES,-ENTOMOLOGICAL BRANCH, DOMINION DEPT. AGRICULTURE.

In August, 1917, while collecting insects at Royal Oak, about four miles north of Victoria, B.C., the writer took two specimens of a Trypetid closely resembling the Apple Maggot fly. These were submitted for identification to Dr. J. M. Aldrich, who found them identical with *Rhagoletis pomonella*. Previous to this there have been only two authentic records of its capture on the Pacific slope. In 1894, five specimens were taken by Mr. O. T. Baron in the southern part of California and were described by Snow (1) as *Rhagoletis zephyria*, n. sp. Later this was shown by R. W. Doane (2) and J. M. Aldrich (3) to be a synonym of *R. pomonella*. No further mention of the existence of this species on the Pacific Slope appears to have been made until 1916, when two specimens of the fly were taken on July 26th of that year by Mr. R. C. Treherne (4) at Penticton, B.C.

There is one other record of the fly on the West Coast, but this does not appear to be quite authentic. In 1911, A. L. Melander (5) reported *R. pomonella* as "destructive along the eastern border of the State," but adds that there is no positive evidence of its occurrence in Washington. It is probable in this case that it has been confused with some other insect and, as will be shown later, notwithstanding its occurrence and comparative abundance, the probabilities are against its being a pest of the apple.

The identity of the species being established, a search was at once made for the host plant. This was found without difficulty. Larvæ resembling the species in question were found infesting the snowberry (*Symphoricarpus racemosus* Michx) and 50 pupæ were obtained and kept over the winter. In the spring of 1918, 42 of these were recovered and on August 19th five flies emerged, which were submitted to Dr. Aldrich and were found by him to be identical in all respects with those taken the previous year. It was found that owing to a

*Contributions from the Entomological Branch, Department of Agriculture, Ottawa.

defective cover on the breeding box, eight flies had emerged previous to this date and had escaped. Altogether 18 flies emerged from the 42 pupæ, up to July 22nd, leaving a balance of 24 to be accounted for. Exactly one month later, hymenopterous parasites commenced to emerge from these remaining pupæ, and during the last week of August 16 appeared. Of the remaining eight pupæ probably some are dead, but possibly a few may carry over until the following summer. Through the courtesy of Dr. L. O. Howard, to whom specimens were sent, this parasite was referred to Mr. A. B. Gahan of the U. S. Bureau of Entomology, who reports that it is a new species of Opius (Vipionidæ) and will be described by him at a later date.

The adult fly has been taken by the writer in the city of Victoria and all over the Saanich Peninsula wherever its host plant, the Snowberry, grows, the earliest date of capture being July 11th, and the larvæ have been found in the berries at various points on the Mainland, including Agassiz, Lillooet, Lytton, Chase, Armstrong, Vernon, Penticton, Creston and Nelson.

The Snowberry is a very common shrub all over the drier parts of the Coast and interior of British Columbia. The clusters of pure white berries are very conspicuous along the country roads in the early fall, but among them will be seen numbers that are brown, and shrunken. These are berries that have been eaten out by the maggot, the proportion of infested berries on a bush often running as high as fifty per cent. As a rule, only one maggot is found in a berry, but occasionally a fly will deposit an egg in a berry that already contains a maggot, as berries have been found containing two larvæ, in widely different stages of growth, If the berry should be a small one and happen to be touching another as is frequently the case, the maggot will leave the small berry when it has eaten out the pulp and enter the adjoining one and complete its growth there. The *Symphoricarpus* berries that are attacked by the fly do not drop to the ground, and the maggots remain in the fruit until the last vestige of pulp has been eaten. Later they bore through the now shrunken and discoloured skin and pupate among the dead leaves and humus below the bushes. In its selection of bushes on which to oviposit the fly shows a decided preference for those growing on high and dry spots, stunted bushes growing on hillsides generally having the heaviest infestation. The species is evidently very abundant and widely distributed, but it is seldom indeed that the adults are seen, the experience of the writer being identical in this respect with that of Mr. William C. Woods (6) with regard to the variety prevalent in blueberries in Maine. Although collecting was carried on very frequently through the summer, less than half a dozen adult flies were taken by the writer in 1918. The explanation of this probably lies in the fact that the flies are exceedingly active and shy, and the advent of a collector with a sweeping net is sufficient to scare most of them away from his vicinity. The only times the writer has had the opportunity of watching the flies at close range have been when they have alighted on the leaves of the Burdock (*Arctium minus*). They have been seen to alight on the broad leaves of this plant and walk about, applying the labella here and there to the leaf surface. They do not stay long, however, and at the least movement on the part of the observer they make off.

In commenting on this species, Dr. Aldrich, to whom I am indebted for the identification of the flies and notes on its distribution, says: "They are slightly

smaller in size than those bred from apples and haws, but I can see nothing upon which to base even a varietal distinction." Thus it is evidently an example of a "biological race," similar to, and perhaps identical with, the apple maggot of the blueberry. The fact of the insect being so abundant in this province, coupled with its heavy parasitization by a new species, suggests interesting possibilities.

As regards any other food plant, diligent search has so far failed to reveal any other host of the fly in the neighbourhood of Victoria, though likely species such as *Crataegus* and wild crab have been thoroughly examined, both during 1917 and 1918. The comparatively large size and soft, pulpy nature of the *Symphoricarpus* berries are, no doubt, the reason for its selection. Certain species of *Vaccinium* are found in the province, but they are nowhere abundant, and have not been met with by the writer in the territory in which observations on the fly have been carried on.

References.

1. Snow, W. A. Kan. Univ. Quart., II, No. 3. pp. 164–165.
2. Doane, R. W. Ent. News, IX, p. 69.
3. Aldrich, J. M. Can. Ent., XLI, p. 69.
4. Treherne, R. C. Can. Ent., XLIX, p. 329.
5. Melander, A. L. Wash. Agr. Exp. Sta. Bull. 103, p. 43.
6. Woods, W. C. Me. Agr. Exp. Sta. Bull. 244, p. 254.

## ENTOMOLOGICAL SOCIETY OF ONTARIO—ANNUAL MEETING.

The fifty-fifth Annual Meeting of the Entomological Society of Ontario was held at the Ontario Agricultural College, Guelph, on Wednesday and Thursday, December 4th and 5th, 1918. The President of the Society, Professor L. Caesar, O.A.C., occupied the chair. The following were present at the meeting: Mr. J. J. Davis, West Lafayette, Ind.; Prof. P. J. Parrott, Geneva, N.Y.; Prof. R. Matheson, Ithaca, N.Y.; Dr. C. Gordon Hewitt; Messrs. Arthur Gibson, C. E. Petch, C. B. Hutchings, F. W. L. Sladen and Dr. S. Hadwen, Ottawa; Prof. E. M. Walker, Toronto; Mr. James Dunlop, Woodstock; Mr. W. A. Ross, Vineland; Mr. W. E. Biggar, Hamilton; Mr. F. J. A. Morris, Peterborough; Mr. W. A. Clemens, Toronto; Mr. H. F. Hudson, Strathroy; Father Leopold, La Trappe, P.Q.; Prof. W. Lochhead, Macdonald College, P.Q.; Mr. F. Letourneau, Oka, P.Q.; Prof. W. H. Brittain, Truro, N.S.; Mr. John D. Tothill, Fredericton, N.B.; Mr. Norman Criddle, Treesbank, Man.; Professors C. J. S. Bethune, L. Caesar, J. E. Howitt and D. H. Jones; Dr. R. E. Stone; Messrs. A. W. Baker, H. G. Crawford, Eric Hearle, R. M. Aiton, H. C. Huckett and others, Ontario Agricultural College.

By the kindness of Dr. Creelman the visitors were entertained in the College residence during their stay in Guelph. This arrangement added much to their pleasure by affording many opportunities for social converse, and also saved the time usually spent in travelling to and from the town. This hospitality was greatly appreciated by all present and a hearty vote of thanks was accorded at the close of the meeting to President Creelman, and to the Matron and Superintendent of the Dining Hall.

On Wednesday morning a meeting of the Council was held at which the

report of the proceedings during the past year was drawn up, and various matters relating to the welfare of the Society were discussed. It was decided to enlarge the pages of the "Canadian Entomologist" in order to be uniform with the standard size of bulletins, and to publish ten instead of twelve numbers per annum, omitting the issues of the two mid-summer months, and at the same time the amount of reading matter is not to be reduced.

In the afternoon the members met in the Entomological Lecture-room in the Biological Building, and the proceedings commenced with the presentation of the reports of the Council and the various officers and branches of the Society, followed by the reading of papers, a list of which is given below.

The open meeting was held on Wednesday evening in the auditorium of the Massey Hall, and was opened by a cheery address of welcome from Dr. G. C. Creelman, President of the College. This was followed by a paper in his usual charming style by Mr. Frank Morris on "The Life-history of a Hobby-horse," giving reminiscences of the dawn and growth of his love for Nature and his development as an Entomologist. The special address of the evening was given by Mr. J. J. Davis, of West Lafayette, Indiana, on "President-day Problems in Entomology," which was listened to with great appreciation and interest. At the close of the meeting the members were hospitably entertained by Dr. Creelman with a smoker at his residence.

The meetings were continued during the morning and afternoon of Thursday, during which the officers for the ensuing year were elected, and the following papers read:

"Economic Entomology in Quebec," by Father Leopold; "Insects of the Season in Ontario," by Mr. W. A. Ross and Prof. Caesar; "Aphids—Their Human Interest," by Dr. A. C. Baker, Washington, D.C.; "A Method for the Preservation of Insect Larvæ and Pupæ," by Dr. F. Slater-Jackson, McGill University, Montreal; "Some Insect Problems in the Prairie Provinces," by Mr. Norman Criddle; "The Recovery of the Brown-tail Parasite, *Compsilura*, in new Brunswick," by Mr. J. D. Tothill; Presidential Address, by Prof. Caesar; "Oestrids" (with lantern slides), by Dr. S. Hadwen; "Further notes on the Control of the Cabbage-root Maggot," by Mr. Arthur Gibson; "Some chapters of the early history of Entomology" (with lantern slide portraits), by Prof. Lochhead; "On the Genitalia of Primitive Insects" (with illustrative diagrams), by Prof. E. M. Walker; "The Pear Psylla," by Mr. W. A. Ross; "Notes on certain species of Bees indigenous to both Canada and Great Britain," by Mr. F. W. L. Sladen; "Control of the Apple Maggott," by Prof. Caesar and Mr. W. A. Ross; "The role which Insects play in the food of Trout," by Mr. W. A. Clemens. Most of these papers will be published in full in the next Annual Report of the Society.

It was decided to hold the next meeting at Ottawa in the autumn of 1919.

The election of officers for the ensuing year resulted as follows: President, Prof. L. Caesar, Ontario Agricultural College, Guelph; Vice-President, Arthur Gibson, Ottawa; Secretary-Treasurer, A. W. Baker, O.A.C., Guelph; Curator, Eric Hearle, Guelph; Librarian, Prof. C. J. S. Bethune, O.A.C., Guelph. Directors: J. M. Swaine, Ottawa; C. E. Grant, Orillia; Dr. A. Cosens, Toronto; F. J. A. Morris, Peterborough; J. W. Noble, Essex; J. F. Hudson, Strathroy; W. A. Ross, Vineland Station; Editor of the "Canadian Entomologist," Prof. E. M. Walker, Toronto; Delegate to the Royal Society, the President.

C. J. S. B.

## NOTES ON THE DELPHACIDÆ IN THE BRITISH MUSEUM COLLECTION.

BY F. MUIR, HONOLULU, T. H.

When tabulating the genera of Delphacidæ* I was unable to place some genera with any certainty, as I was only acquainted with them through descriptions, which did not mention the characters which I used for primary divisions. Thanks to the kindness of the British Museum authorities I have been able to examine the Delphacidæ in their collection and to make the following notes upon them.

I wish to point out that *Delphacodes* Fieb. (*Delphax* and *Liburnia* of some authors) and allied genera are difficult to deal with, and unless great care be exercised, confusion will arise whenever one goes beyond a comparatively small faunistic area. The species of these genera can only be identified with any certainty by the use of the genitalia; not only should the characters found in the pygofer, anal segment and genital styles be used, but the aedeagus or penis should be dissected out. Many species have a wide geographical distribution and a large range of colour variation, which has led to synonymy. The demarcation between *Delphacodes* Fieb. and its allies is not definitely settled, and will not be until a study of species from various parts of the world shows us the range of variation within the genera. It is, therefore, with reservation that one must synonymize at the present time.

**Canyra** Stål.

The four species standing under this name, *C. strigulosa* Walk., *C. revertens* Walk., *C. retrahens* Walk. and *C. vittifrons* Walk. are the same as *Ugyops*, but they have a longitudinal depression along the *first* joint of the antennæ. I have not seen the type species of the genus.

**Epibidis** Fowler.

This genus is congeneric with the four species under *Canyra* and has the *first* antennal joint sulcate.

**Ugyops** Guein.

*Delphax longicornis* Walker and *Delphax media* Walker, both belong to this genus.

**Consualia** Distant.

I cannot separate this from *Ugyops*.

**Onkelos** Distant. = *Punana* Muir.

**Ilburnia** White. = *Nesosydne* Kirkaldy.

*Delphax simulans* Walk. belongs to this genus.

*Ilburnia nephelias* (Kirk.) = *I. disjuncta* (Muir).

**Ambarvalia** Distant.

The tibial spur is cultrate, half the length of the first tarsus, convex on both sides, with three teeth on the hind margin. The spur places this insect in the *Alohini*, otherwise the insect has a superficial resemblance to the Tropidocephalini.

**Upachara** Distant.

The genus has the spur small, thick, with a tooth at the apex, but none on

*Canadian Entomologist 1915, page 296 e. o.

the hind margin. I consider it should be placed in the Tropidocephalini. The carinæ of the head and thorax are obscure.

**Pundaluoya** Kirkaldy.

The type of this genus, *Delphax ernesti* Kirby, has the tibial spur cultrate, thick, concave on the inner surface, without teeth on the hind margin. I place it in the Tropidocephalini. The carination of the head is similar to that of *Belocera* Muir but, apart from the spur, the terete antennæ distinguishes it from that genus as well as from *Perkinsiella* Kirk. There is no carination on the lateral margin of the pronotum.

The genus *Peregrinus* Kirk. is quite distinct in general facies, shape and carination of head and thorax. The six species under the genus I place as follows:

1. *Pundaluoya ernesti* (Kirby). Type.
2. *Pundaluoya simplex* Dist. Typical. This only differs in the lighter colour from *P. ernesti* and is represented by a female. Only the capture of the male will decide if this be only a colour variety or not.
3. *Pundaluoya simplex* Dist. = *Peregrinus maidis* (Ashmead).
4. *Pundaluoya insignis* Dist. = *Perkinsiella insignis* (Dist.).
5. *Pundaluoya facilis* Dist. = *Perkinsiella facilis* (Dist.).
6. *Pundaluoya pulchella* Dist. = *Phyllodinus pulchella* (Dist.).

The front legs of this species are flattened, otherwise it would be a *Dicranotropis*.

**Zuleika** Distant.

First tarsus slightly longer than the other two together, spur as long as the first tarsus, broad, laminate, with small teeth on the hind margin. Lateral carinæ of pronotum slightly diverging curved. I cannot separate this genus from *Chlariona*.

**Opiconsiva** Distant. = *Delphacodes* Fieb.

1. *O. fuscovaria* Dist. = *Delphacodes puscovaria* (Dist.).
2. *O. insularis* Dist. = *Megamelus furcifera* (Horv.).
3. *O. derelicta* Dist. = *Megamelus furcifera* (Horv.).

This is a light female specimen of *O. insularis*.

4. *O. modesta* Dist. = *Delphacodes modesta* (Dist.).
5. *O. balteata* Dist. = *Megamelus furcifera* (Horv.).

The second specimen under this name is a different species.

6. *O. colorata* Dist.

The genitalia of this species are similar to *M. furcifera* (Horv.), but the head and thorax are black, except in the two brachypterous specimens, in which there is a light mark down the middle of the thorax.

7. *O. gloriosus* Dist.

One specimen without abdomen, similar to *M. furcifera* (Horv.).

**Nilaparvata** Distant. = *Delphacodes* Fieb.

The type of this genus is a damaged male, but it is in good enough condition to enable me to be sure of the synonymy of the species.

1. *Nilaparvata greeni* Dist. = *Delphacodes sordescens* (Motsch.) = *Delphacodes anderida* (Kirk.).

I was in doubt as to whether *D. sordescens* was the same as *D. anderida* until I had examined the Indian specimens.

2. *Nilaparvata mahensis* Dist. = *Delphacodes mahensis* (Dist.).

**Toya** Distant. = *Delphacodes* Fieb.

This genus is described as having a transverse ridge between the eyes, but it has the same carination of the vertex as *Delphacodes* (*Liburnia* of some authors); the medio-basal carina dividing the two basal areas is obscure. The pronotal lateral carinæ slightly divergingly curved, not reaching the hind margin. Vertex as wide as long. Second joint of antennæ slightly more than twice the length of the first. First hind tarsal joint slightly longer than the other two together, spur broad, laminate, as long as the first tarsus, small teeth on the hind margin.

*Toya attenuata* Dist. = *Delphacodes attenuata* (Dist.).

**Kalpa** Distant = *Delphacodes* Fieb.

1. *Kalpa aculeata* Dist. = *Delphacodes sordescens* (Motsch.).

This is represented by one female, the type, which, on account of the difference in coloration appears to have more pronounced carinæ on the head than has the male. This species and *D. bakeri* Muir, are peculiar in having small spines on the basal joint of the hind tarsus.

**Akilas** Distant.

I cannot separate this genus from *Gelastocephalus* Kirk.

**Hapalornelus** Stol.

The spur of this genus is narrow, pointed and thickened, with the inner surface distinctly concave, with many small teeth on the hind margin. The pro- and metanota each have three carina. The long, narrow wings constricted in the middle where the cross-veins are, distinguish it from other genera.

**Sogata** Distant.

The type of the genus, *S. dohertyi* Dist., is represented by one female. The first hind tarsal joint is longer than the other two together; tibial spur laminate, many fine teeth on hind margin, not so long as the first tarsal joint. Second joint of antennæ more than twice the length of the first. Vertex, longer than wide, base wider than apex; length of face three times the width. This comes very close to *Kelesia*.

1. *Sogata dohertyi* Dist.

2. *Sogata sternalis* Dist. Very near to *Kelesia kirkaldyi*, but it is necessary to dissect out the aedeagus.

3. *Sogata pusana* Dist. Very near to *Kelesia fieberi* Muir, but it is necessary to dissect out the aedeagus.

4. *Sogata distincta* Dist. = *Megamelus furcifera* (Horv.). The type and two other specimens are as above, while four other specimens under this name are *Sogata pusana* Dist.

5. *Sogata pallescens* Dist. Five specimens including the type are *Megamelus furcifer* (Horv.), while eight other specimens under this name are *Delphacodes sordescens* (Motsch.).

6. *Sogata thoracica* Dist. = *Delphacodes thoracica* (Dist.).

*Delphax unicolor* Walk., from Hudson Bay is a nymph and not of a delphacid.

**Matutinus** Distant.

This genus was placed among the Cixiini, but it is a Delphacid, which I consider to be indistinguishable from *Chlorionidea* Fieb.

# ODONATA OF THE FRANCONIA REGION, NEW HAMPSHIRE.

BY R. HEBER HOWE, JR., CONCORD, MASS.

Mrs. Annie T. Slosson's captures of Odonata in Franconia, made now over a decade ago, have already attracted odonatologists to a recognition of this interesting region. Franconia is thus the type locality of *Gomphus borealis* Needham, and *Somatochlora minor* (Calv.), and five of Dr. Scudder's species were first described from the White Mountain region. It has been difficult, however, to limit the scope of this paper to just the township, and impractical to take a definite radius, for lying so near the Connecticut Valley, a very varied topographic region would be included, when it seems more interesting and proper to make the paper one on the mountain and foothill stations. I am, therefore, including the records made for the immediate region of the higher White Mountains, a region I think often referred to by Hagen and others on odonate labels as "White Mts." The list thus includes the notable records and type stations of Dr. S. H. Scudder on Mt. Washington, and at The Glen, and records of Dr. P. P. Calvert at Fabyan's, Dr. G. M. Allen at Intervale in 1899, etc.

My own collecting in this region includes one day's trip made in 1916, from southern New Hampshire,north through the Profile Notch and south again by the Crawford (Psyche 24:45-53, 1917), and during the past summer when I was a resident of Franconia from June 24 to August 5, and during a two days' trip on June 1 and 2. One of the interesting features of my list is, not so much that I failed to find many species recorded by Mrs. Slosson over her long years of collecting in the region, but that in one summer I should have taken a considerable number of common species which it seems she certainly would have found: facts indicating very probably changes or local extensions of insect ranges in this region.

## Zygoptera.

### AGRIONIDÆ.

1. *Agrion amatum* Hagen.

   June to July. Mrs. Slosson writes me, "There are not many bodies of water around Franconia where he was not to be found twelve years ago,—Pond Brook, Streeter Pond, Black Brook, along the Gale River, everywhere." Dr. Allen found it common at Intervale by the river, last seen on July 29. This species I was unable to find at all in the entire region.

2. *Agrion æquabile* Say.

   June to July. Dr. Allen found it along the Saco River from June 27 to July 3.

3. *Agrion maculatum* Beauv.

   June 20 to 27.

   I found it common about the brooks leading out of Echo and Profile Lakes, uncommon on Black Brook, and at Pearl Lake, Lisbon. It was taken at Intervale by Dr. Allen from June 20 to July 12. There is a male in U. S. N. Museum taken at Franconia by Mrs. Slosson.

CŒNAGRIONIDÆ.

4. *Lestes congener* Hagen.

August and September. Dr. Allen took three specimens in the Saco meadows at Intervale,—July 3 to 26. There is a specimen in the U. S. N. Museum taken at Franconia by Mrs. Slosson.

5. *Lestes disjunctus* Selys.

June to August. Mrs. Slosson collected this species at Franconia, June 26, and Dr. Calvert at Fabyan's. Between July 16 and 29 I found it common at Mill Pond, Lyman, and at Pearl Lake, Lisbon. It was taken commonly at Intervale and North Conway by Dr. Allen, from June 21 to Sept. 13, and by a collector named Skinner at Jackson.

6. *Lestes eurinus* Say.

June. Dr. Allen took three specimens at a small pond near Saco River, North Conway, on June 29, the northernmost station in New England for the species.

7. *Lestes forcipatus* Rambur.

June to August. Dr. Allen took several specimens in the Saco meadows, Intervale, from June 21 to August 8.

8. *Lestes inequalis* Walsh.

June and July. Mrs. Slosson collected this species in June at Franconia, and Dr. Allen at Intervale from July 3 to 26 in the Saco meadows.

9. *Lestes rectangularis* Say.

June 22 to Sept. 18. Mrs. Slosson collected it at Franconia, and Dr. Allen at Intervale, and North Conway in the Saco meadows and at Pudding Pond.

10. *Lestes uncatus* Kirby.

June. Mrs. Slosson secured it at Franconia, and Dr. Allen two females, (determination doubtful) on June 27 in the Saco meadows.

11. *Lestes unguiculatus* Hagen.

June 12. There is a specimen in the Museum of Comparative Zoölogy at Cambridge labeled "White Mts.," and I took one specimen at Streeter Pond (upper) which flew from my hand after capture, and which I am reasonably sure was of this species. Mrs. Slosson writes me she has taken it at Franconia.

12. *Lestes vigilax* Hagen.

July and August. Dr. Allen secured it at Pudding Pond, North Conway, from July 1 to August 21.

13. *Argia moesta* Hagen.

Dr. Allen collected it at Pudding Pond, North Conway.

14. *Argia violacea* Hagen.

June and July. I took specimens from July 17 to 31 at Partridge Lake, Littleton, and at Forest Lake, Whitefield. Dr. Allen found it common at Intervale from June 20 to August 9.

15. *Enallagma calverti* Morse.

June to August. I found it common at Profile and Echo Lakes, Franconia, from June 27 to August 12, and took one specimen at Lonesome Lake, Lincoln, July 4.

16. *Enallagma cyathigerum* Charp.

July. Mrs. Slosson collected it at Franconia, and Selys records it from Hermit Lake, Mt. Washington. I took it on July 4 commonly about Lonesome Lake, Lincoln.

17. *Enallagma aspersum* Hagen.

July to August. Dr. Allen took several specimens in the Saco meadows, at Pudding Pond and Echo Lakes, North Conway, from June 19 to August 21. He remarks, "Larger than usual, but apparently of this species." There is a specimen in the U. S. N. Museum from Echo Lake, North Conway, taken in 1890.

18. *Enallagma ebrium* Hagen.

July and August. I took it commonly at Streeter Pond, Franconia, and at Mill Pond, Lyman, from July 3 to 26. Dr. Calvert secured it at Fabyan's in August.

19. *Enallagma hageni* Walsh.

June to August. There is a male in the U. S. N. Museum from Franconia collected by Mrs. Slosson, and Dr. Allen took it commonly in the Saco meadows from June 20 to August 6. I found it common at Streeter Pond, Franconia; Partridge Lake, Littleton; Pearl Lake, Lisbon; Forest Lake, Whitefield, from July 3 to July 31.

20. *Nehalennia irene* (Hagen).

July. There is a male in the U. S. N. Museum collected by Mrs. Slosson at Franconia and Mt. Washington. Dr. Allen took it at North Conway on July 1, and I found them common at Streeter Pond, Franconia; Mill Pond, Lyman; Partridge Lake, Littleton, and at Bowles' Pond on Lafayette Brook, from July 3 to 29.

21. *Amphiagrion saucium* Burm.

June to July. Mrs. Slosson collected it at Franconia,—Dr. Allen on the Saco meadows, Intervale, from June 19 to July 10, and I secured several specimens at Mill Pond, Lyman, on July 16 to 17.

22. *Chromagrion conditum* Hagen.

June to July. Mrs. Slosson collected it at Franconia, Dr. Allen in the Saco meadows, Intervale, from June 22 to July 6,—there is a male in the U. S. N. Museum collected by Mrs. Slosson at Franconia, and I took a male at Profile Lake on July 20.

23. *Ischnura posita* Hagen.

There is a specimen in the Museum of Comparative Zoology labeled "White Mts."

24. *Ischnura verticalis* Say.

June to September. There is a male in the U. S. N. Museum collected at Franconia by Mrs. Slosson,—Dr. Allen took it commonly at Intervale from June 19 to September 13,—Dr. Calvert collected it at Fabyan's,—Skinner took it at Jackson,—there is a specimen from North Conway in the Museum of Comparative Zoology,—and I found it common at Streeter Pond, Franconia; Mill Brook, Lyman; Forest Lake, Whitefield; Partridge Lake, Littleton; Pearl Lake, Lisbon, and at Bowles' Pond, Lafayette Brook, Franconia, from July 3 to 31.

This is one of the most abundant and evenly distributed species in New England.

## Anisoptera.

### Aeschnidæ.

25. *Cordulegaster diastatops* Selys.

June to August. Mrs. Slosson took it at Franconia, and there is a specimen in the U. S. N. Museum collected by her. Dr. Allen took it in the Saco meadows, Intervale, from June 22 to July 1, and it was reported from the "White Mts." by Selys.

26. *Cordulegaster maculatus* Selys.

June to July. Dr. Allen took it at Diana's Baths, North Conway, and in the Saco meadows, Intervale, from June 19 to 22,—and I found it common at the outlets of Echo and Profile Lakes from July 20 to 27.

27. *Ophiogomphus colubrinus* Selys.

Recorded from the "White Mts." by Mr. Banks.

28. *Ophiogomphus aspersus* Morse.

June and July. Dr. Allen took two males and a female on Mt. Bartlett on June 24 and July 20, and a female at Intervale on July 4.

29. *Ophiogomphus mainensis* Packard.

Recorded from the "White Mts." by Selys, and from Franconia by Mrs. Slosson.

30. *Gomphus albistylus* Hagen.

July 20 to August 1. I found it common at the outlet from Echo Lake between the above dates.

31. *Gomphus borealis* Needh.

One of the type specimens was collected by Mrs. Slosson at Franconia. Dr. Allen took a female of *G. descriptus* (?) in the Saco meadows, June 21, which may belong here.

32. *Gomphus exilis* Selys.

June and July. I found tenerals at Echo Lake on July 20; an adult at Profile Lake July 27, and an adult at Pearl Lake, Lisbon, on July 25. Dr. Allen found it common at North Conway and Intervale from June 19 to 29.

33. *Gomphus parvulus* Selys.

June. Hagen recorded it from the "White Mts." in June. Mrs. Slosson from Franconia, and on June 28 I took a female near Lafayette Brook, Franconia, where I saw two others.

34. *Gomphus spicatus* Hagen.

June. Mrs. Slosson found it at Franconia on June 17. Dr. Allen took it in the Saco meadows, Intervale, from June 20 to 24.

35. *Gomphus brevis* Hagen.

June. Dr. Allen took both sexes on the Saco meadows, Intervale, from June 20 to 24.

Note.—*Gomphus notatus* Ramb., was probably taken at Campton, but the mis-spelling of the locality recorded makes the record doubtful.

36. *Basiæschna janata* Say.

June and July. Recorded from the "White Mts." by Hagen. I

found it at Echo Lake from June 30 to July 20. Dr. Allen took one at Intervale on July 4 in the Saco meadows.

37. *Anax junius* Drury.

July. I saw one at Streeter Pond, Franconia, on July 3. Mrs. Slosson reports one on the Gale River on June 20.

38. *Aeshna canadensis* E. Walker.

July and August. Recorded from the "White Mts." by Shurtleff. Dr. Calvert took it at the White Mt. House, at Franconia, and at Fabyan's. I found it common at Mill Pond, Lyman, on July 29.

39. *Aeshna constricta* Say.

August and September. It was taken at Hermit Lake, and Fabyan's by Dr. Calvert, and by Dr. Allen at Carter's Notch, and Intervale from August 21 to September 18. It is probably that some of the latter material should have been referred to *A. umbrosa*, a closely related species since described.

40. *Aeshna eremita* Scudd.

August. The type was taken at Hermit Lake, Mt. Washington, by Dr. Scudder, and it was also taken there by Mrs. Slosson, and a specimen of her collecting is in the U. S. N. Museum. I took it at Profile Lake August 12, 1916, and it was common at Lonesome Lake, Lincoln, on August 1. Undoubtedly undetermined material collected in July to September at Carter's Notch by Dr. Allen belongs here.

41. *Aeshna juncea* Linn.

August. It was recorded from the "White Mts." by both Scudder and Hagen. Mrs. Slosson also took it at Franconia.

42. *Aeshna cærulea septentrionalis* Burm.

It was recorded from the "White Mts." by both Scudder and Hagen.

43. *Aeshna umbrosa* E. Walker.

August. Mrs. Slosson took it at Franconia, and a specimen collected by her is in the U. S. N. Museum. It was recorded from the "White Mts." by Sprague, and from Hermit Lake by Scudder. I took a specimen at Lonesome Lake, Lincoln on August 1, and one in Franconia on the same day.

44. *Aeshna verticalis* Hagen.

July to September. Dr. Allen took it at Hermit Lake, Mt. Washington; at Carter's Notch; at Intervale and North Conway from July 22 to Sept. 11. In view, however, of the southern range of this species it would seem probable that his specimens were misdetermined. *A. canadensis*, a very closely related species, undescribed in 1899, was probably the insect captured.

### Libellulidæ.

45. *Macromia illinoiensis* Walsh.

June. Dr. Allen took a male at Intervale on June 18.

46. *Dorocordulia libera* Selys.

Mrs. Slosson took it in Franconia.

47. *Helocordulia uhleri* Selys.

June. I took a male on June 25 at Echo Lake, Franconia.

48. *Somatochlora albicincta* Burm.

July and August. Drs. Calvert and Scudder found it at Hermit Lake, Mt. Washington. Dr. Allen at Carter's Notch on July 24. I found it at Lonsome Lake, Lincoln, from July 4 to August 1, and at Profile Lake, Franconia, from July 20 to 27.

49. *Somatochlora cingulata* Selys.

July. Hagen reported it from the "White Mts.," and Dr. Allen took four specimens at Carter's Notch on July 22.

50. *Somatochlora forcipata* Scudd.

July. Mrs. Slosson took it at Franconia and on Mt. Washington. Dr. Scudder's type was taken at "The Glen, White Mts.," and I took it at Profile Lake on July 20.

51. *Somatochlora elongata* Scudd.

July and August. Dr. Scudder's type was taken in the "White Mts." at Hermit Lake, Mt. Washington, and Mrs. Slosson took it at Franconia, and a specimen collected by her is in the U. S. N. Museum. Dr. Allen took it in the Saco meadows, Intervale, from Aug. 16 to 21 and I took two specimens at Profile Lake, July 27.

52. *Somatochlora minor* Calvert.

June. One of Dr. Calvert's types came from Franconia, where it was also taken by Mrs. Slosson on the Butter Hill Road.

53. *Somatochlora tenebrosa* Say.

August. Dr. Allen took one at Intervale on August 15.

54. *Somatochlora walshii* Scudd.

August. Dr. Scudder's type was taken at The Glen, "White Mts."

55. *Cordulia shurtleffi* Scudder.

June to August. Dr. Scudder's type was taken at Hermit Lake, Mt. Washington. Mrs. Slosson took it at Crawford Notch and Franconia, and I took it at Echo Lake, June 27.

56. *Tetragoneuria canis* MacLach.

Mrs. Slosson took one example of this species at Franconia.

57. *Libellula exusta* Say.

June and July. Mrs. Slosson took it at Franconia, and I found it at Streeter pond, Franconia, from July 3–12. Dr. Allen took it at Intervale from June 19 to July 28.

58. *Libellula pulchella* Drury.

July. Mrs. Slosson took it at Franconia, and Dr. Allen at Intervale from July 20 to Aug. 31. I found it common at Pearl Lake, Lisbon, on July 25, and at Mill Pond, Lyman, on July 29.

59. *Libellula quadrimaculata* Linn.

June and July. Mrs. Slosson found it at Franconia, and I found it common at Mill Pond, Lyman, July 16, and saw one specimen at Pearl Lake, Lisbon, on July 25.

60. *Plathemis lydia* Drury.

June and July. Mrs. Slosson found it at Franconia, and Dr. Allen at Intervale from June 22 to July 24.

61. *Nannothemis bella* Uhler.

July. Dr. Allen took it at Pudding Pond, North Conway, from July 1 to 28, and I found it common at Mill Pond, Lyman, July 16 to 29.

62. *Sympetrum costiferum* Hagen.
July and August. Mrs. Slosson took it at Franconia, and a specimen of her collecting is in the U. S. N. Museum. Dr. Allen took it from July 28 to Aug. 21 at North Conway and Intervale. I found it common at Streeter Pond, Franconia, and at Forest Lake, Whitefield, from July 12 to 31.

63. *Sympetrum rubicundulum* Say.
July and September. Mrs. Slosson took it at Franconia and Mt. Washington; Dr. Calvert at Fabyan's; Hagen records it from Hermit Lake, "White Mts.;" and Dr. Allen took it from July 4 to Sept. 1, at North Conway and Intervale. I found it at Pearl Lake, Lisbon, and at Mill Pond, Lyman, from July 25 to 29.

64. *Sympetrum obtrusum* Hagen.
July and August. Dr. Calvert took it at Fabyan's, and Dr. Allen at North Conway and Intervale from July 4 to Sept. 1. I took a single male at Pearl Lake, Lisbon, on July 25. Mrs. Slosson took it at Franconia.

65. *Sympetrum scoticum* Donovan.
Mrs. Slosson took one example at Franconia. It has never been taken again in New England.

66. *Sympetrum semicinctum* Say.
July and August. Hagen recorded it from the "White Mts."; Mrs. Slosson from Franconia; Dr. Calvert from Fabyan's; and Dr. Allen took one at Intervale on Aug. 16. I found it at Streeter Pond, July 12, and at Mill Pond, Lyman, on July 17.

67. *Sympetrum vicinum* Hagen.
Mrs. Slosson took it at Franconia; Dr. Calvert at Fabyan's; and Dr. Allen at Intervale from Aug. 10 to Sept. 13.

68. *Leucorrhinia frigida* Hagen.
July. Mrs. Slosson took it at Franconia and Mt. Washington, and Dr. Allen on July 1, at Pudding Pond, North Conway.

69. *Leucorrhinia glacialis* Hagen.
June and July. Mrs. Slosson took it at Franconia, and on Mt. Washington. Hagen recorded it from the "White Mts." Dr. Allen at North Conway from June 21 to July 1. I found it common at Lonesome Lake, Lincoln, on July 4, and rare on Aug. 1.

70. *Leucorrhinia intacta* Hagen.
June and July. Mrs. Slosson took it at Franconia, and on Mt. Washington. Dr. Allen found it common at Intervale from June 20 to July 4. I found it at Streeter Pond, Franconia on July 3, and at Mill Pond, Lyman, on July 17.

71. *Leucorrhinia hudsonica* Selys.
Mrs. Slosson took it at Franconia, and on Mt. Washington.

72. *Leucorrhinia proxima* Calvert.
Mrs. Slosson took it at Franconia, and on Mt. Washington, and there is a specimen in the U. S. N. Museum collected by her. Hagen recorded it from the "White Mts."

## THE IDENTITY OF THE WHEAT MIDGE IN ONTARIO.

BY W. A. ROSS, DOMINION ENTOMOLOGICAL LABORATORY, VINELAND STA., ONT.

In connection with the re-appearance in Ontario of the wheat midge or "red weevil" in fairly large numbers in 1917 and in lesser numbers this year, it is worth while recording that our species is *Thecodiplosis mosellana* Gehin, and not as we thought, *Cecidomyia*, or *Diplosis*, *tritici* Kirby. This summer I reared a considerable number of adult midges from larvæ collected in 1917 in Welland and Lincoln Counties and submitted them to Dr. E. P. Felt, who, after making a careful examination, sent me the following report: "I have decided that the species is with very little question *Thecodiplosis mosellana* Gehin. I find on looking up our records that we reared the same insect in 1912 from wheat heads collected at Batavia, N.Y., and the probabilities are, so far as this country is concerned, that this is the destructive wheat midge. . . . I am well satisfied that this is not the *Cecidomyia*, or *Diplosis*, *tritici* Kirby unless the characterizations and illustrations of this insect are erroneous, something we are hardly warranted in assuming."

Fig. 1.—Wheat Midge (*Thecodiplosis mosellana* Gehin.), much enlarged.

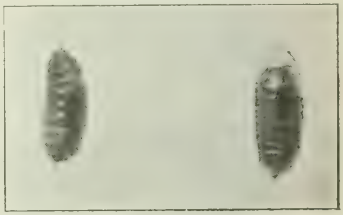


Fig. 2.—Maggots of Wheat Midge, much enlarged. The larva on the right is within its larval case.

## CATOCALA ULALUME STRECK. VS. CATOCALA CAROLINA HOLLAND.

BY G. H. FRENCH, CARBONDALE, ILL.

In September, 1877, Herman Strecker described *Catocala ulalume* in his serial, "Lepidoptera Rhopaloceres et Heteroceres," page 132. In the April number of the Bulletin of the Brooklyn Entomological Society for 1880, page 97, Mr. Strecker describes *Catocala dejecta*. I have taken both of these in this (Jackson) County, Ill., and if my memory serves me correctly a specimen of *ulalume* was submitted to Mr. Strecker for identification.

In his book, "The Moth Book," Dr. W. J. Holland figures *Catocala carolina* as a new sub-species—the date of copyright of both being 1903.

This season I have taken a number of *Catocala ulalume*, some of them of the size of Dr. Holland's figure, while others are larger. Why is not Dr. Holland's *C. carolina* Mr. Strecker's *C. ulalume?* The markings are the same and they are constant. I would not class it as a form of *L. dejecta* without breeding. I tried to get eggs this season to breed it but failed. I always find *C. ulalume* on hickory trees, sometimes several on the same tree, having much the habit of *C. flebilis*.

# A NEW SPECIES OF ARGIA (ODONATA).

BY CLARENCE H. KENNEDY, RALEIGH, N. C.

**Argia rita,** n. sp.

*Holotype.*—Female, collected in the Santa Rita Mts., Arizona, July, by F. H. Snow, and now in the Snow collection at Kansas University, Lawrence, Kansas. The label does not give the year, but gives the elevation as 5 to 8,000 feet. The male is unknown.

It is difficult to even surmise the nearest relatives of this species. The shape of the lateral lobe of the mesostigmal lamina suggests that of *agrioides*, but in *agrioides* there is no pit beneath it.

Length of abdomen 30 mm., length of hind wing 26 mm.

*Female.*—Colour: labium pale, labrum bluish (?), face and head otherwise violaceous except the ventral surfaces which are pale straw. Each postocular area bounded anteriorly and posteriorly by a narrow bar of black.

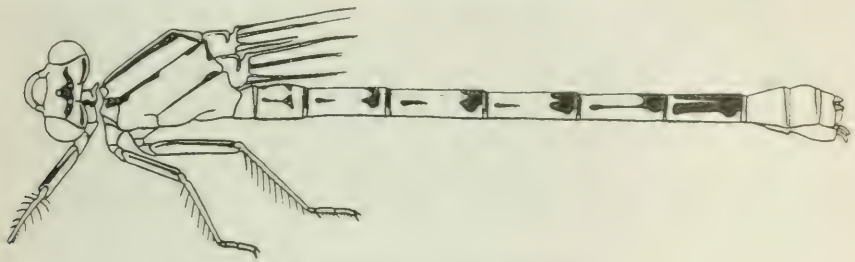


Fig. 3.—*Argia rita:* colour-pattern of type.

Prothorax violaceous, darker above, the side with a sinuous line, the dorsum with a heavy Y mark, the fork opening caudad.

Mesothorax and metathorax violet becoming paler on the sides. Mid-dorsal keel pale but edged by a very narrow, mid-dorsal, black stripe which widens above but fades out below. Pits of mesostigmal laminæ black. Antealar ridges black. A small, black spot on the upper part of the mesinfraepisternum. Humeral stripe narrow in the lower half, narrowing to a hair line above but widening into an oval spot at the alar ridge. Second lateral suture with a hair line of black. Pterostigmata brown. Legs with a narrow anterior stripe on the femur and a pale brown stripe on the ventral side of the tibia, otherwise bluish gray.

Abdomen violaceous on segments 1 and 2, brown on segments 3 to 7, and blue on segments 8 to 10. The following black markings occur (see fig. 3): a pair of stripes on segment 2, mere hair lines with the posterior end of each enlarged into a triangular spot; an apical ring, incomplete below on segments 2 to 6; a saddle-shaped spot on the apex of segments 3 to 6. This is connected

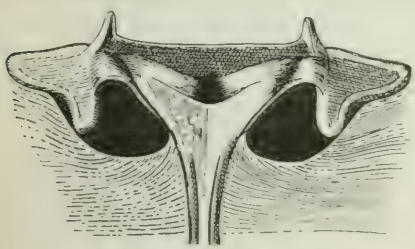


Fig. 4.—*Aogia rita:* dorsal view of mesostigmal laminæ.

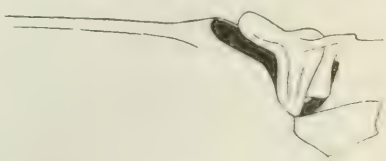


Fig. 5.—*Argia rita:* lateral view of mesostigmal laminæ.

anteriorly on segment 6 with a lateral line on either side which appears on segments 3 to 5 as a detached antero-lateral spot. Segment 7 with the dorsum black except for a narrow space across the anterior end and the anterior two-thirds of the mid-dorsal line which are pale.

This female is distinguished at once by the two enormous pits or depressions on the anterior ends of the mesepisterna. There is one under each mesostigmal lamina. See figs. 4 and 5.

In the figure (3) of the colour-pattern the abdomen is slightly rotated.

This description should have appeared in the paper on new Argias, recently published in the Canadian Entomologist, but was overlooked.

## SOME NEW LACHNIDS OF THE GENUS LACHNIELLA.

(HOMOPTERA–HEMIPTERA.)

BY H. F. WILSON, MADISON, WIS.

The genus *Lachniella* is now understood to be the correct genus for most of the Lachnids formerly placed in the genus *Lachnus*. The type of the true genus Lachnus is *Lachnus fasciatus* Burmeister, a species definitely determined upon by European aphidologists. This species has but one branch to the median vein, while Lachniella has two forks. The writer has under preparation a *Monograph of the Lachninæ of North America*, but it now seems impossible to have the illustrations printed until after the war, and so the following new species are presented at this time.

### Lachniella inoptis, n. sp.

From material collected by Mr. Theo. Pergande at Washington on *Pinus inops?* Two slides containing one alate and four apterous specimens both labeled *Lachnus inoptis*, n. sp. Types in collection of U. S. Bureau of Entomology.

*Apterous viviparous female.*– Antennæ light at the base and dusky at the tip. Femora of all legs dark, front tibiæ entirely black. Tibiæ on middle and hind pair of legs light coloured at the base and black over the distal two-thirds. Antennæ long and slender, the sixth segment finger-like and slightly shorter than the fourth. Third segment approximately equal to the fourth and fifth together; fifth considerably larger than the fourth. Third and fourth segments without sensoria, fifth with one large sensoria at the distal end. Cornicles with a large, acutely sloping base. Cauda acute, anal plate slightly disked. Hairs on antennæ, legs and body distinctly spine-like and long.

*Measurements.*—Length of body 3.25 mm. Length of antennal segments, III, 0.64 mm.; IV, 0.31 mm.; V, 0.37 mm.; VI, 0.22 mm. Total length 1.76 mm. Beak, III, 0.25 mm.; IV, 0.25 mm.; V, 0.12 mm. Total length 2.08 mm. Length of hind tibiæ 2.39 mm.; hind tarsus, 0.25 and 0.37 mm.

*Alate viviparous female.*—Antennæ light coloured throughout the third segment except a small part at the distal end, fourth and fifth segments light dusky at the base, darker at the tip, sixth segment entirely dusky. Femora dark except at the base, tibiæ dark at the knees and along the distal one-third, the basal two-thirds light-coloured. Third antennal segment with a single sensoria near the distal end, fourth segment with none, fifth segment of one antenna with one large sensorium at the distal end, the other one with an

additional smaller one at the centre. The beak extends slightly beyond the hind pair of coxæ. Nectaries large and volcano-shaped. Wing venation typical for the genus. Hairs upstanding, long and thick, distinctly spine-like.

*Measurements.*—Length of body 3.25 mm. Length of antennal segments: III, 0.64 mm.; IV, 0.31 mm.; V, 0.35 mm.; VI, 0.23 mm. Total length 1.7 – mm.? Beak: III, 0.27 mm.; IV, 0.23 mm.; V, 0.1 mm. Total length 2 mm. Length of hind tibia 2.4 mm.; hind tarsus 0.25 and 0.37 mm.

### Lachniella thunbergii, n. sp.

Described from five slides containing a number of oviparous females and one alate male. Three of the slides also contain apterous specimens of another species. No description of the latter has been attempted. The following notes from Mr. Theo. Pergande's records were furnished me by Mr. Baker. Types in collection of U. S. Bureau of Entomology.

*Apterous oviparous female.* — Specimens in balsam, colour cannot be determined. Antennæ in balsam clear except at tip, distal end of third and fourth, and all of fifth and sixth antennal segments, deep brown, nearing black. Legs with knees dark brown, first and second pair with tibiæ light in the middle and dark at the ends. Hind tibiæ with clear area extending only from near base to one-third the entire length; tarsi and other portions dark brown. Body, legs and antennæ with setaceous upstanding hairs.

Antennæ reaching to second pair of coxæ. Third and fourth segments with a single small, round sensoria near the distal end. Fifth with two large sensoria toward the distal end. Nectaries bell-shaped and of medium size. Anal plate bilobed. Hind tibiæ with numerous small sensoria.

*Measurements.*—Length of body 3.4 mm. Length of antennal segments: III, 0.46 mm.; IV, 0.21 mm.; V, 0.23 mm.; VI, 0.2 mm. Total length 1.25 mm. Length of beak 1.67 mm. Length of hind tibiæ 2.23 mm. Length of hind tarsus 0.29 mm.

*Alate Male.*—Antennæ black throughout. Front legs with femora yellowish at the base and brownish black toward the knee, knee nearly black, tibiæ light brown, being darker at the base and at the tip, tarsi dusky brown to black. Middle legs the same. Hind legs with tarsi, tibiæ and distal two-thirds of femora brownish black. Antennæ long and stout, and the third, fourth and fifth segments with numerous raised sensoria of variable size. Wing venation as in other species of this group. Nectaries appear to be much larger than in the apterous forms and with a much wider cone-shaped base.

*Measurements.*—Length of body from vertex to tip of abdomen, 2.25 mm. Length of antennal segments: III, 0.7 mm.; IV, 0.29 mm.; V, 0.146 mm.; VI, 0.21 mm. Total length 1.7 mm. Length of beak 1.77 mm. Length of hind tibiæ 2.17 mm. Length of hind tarsi 0.31 mm.

### Lachniella vandykei, n. sp.

From material collected at Hemphry, Washington, by E. C. Van Dyke on Picea sp., May 28, 1914. Original material in alcohol, descriptions from balsam mounts. Types in writer's collection.

*Apterous viviparous female.*—Antennæ light toward the base and dusky toward the tip. Legs light toward the basal portion and dusky otherwise. Nectaries and cauda dusky to black. Antennæ with the third segment shorter

than the fourth, fifth and sixth. Fourth segment shorter than the sixth. Third segment with one, two or no sensoria, fourth with one, and fifth with two. Beak extending to base of nectaries. Nectaries large and broadly cone-shaped. Body globose, the abdomen being wider than long. Body, legs and antennæ set with fine, silky hairs of medium length.

*Measurements.*—Length of body 2.25 mm. Length of antennal segments: III, 0.41 mm.; IV, 0.187 mm.; V, 0.23 mm.; VI, 0.19 mm. Total length 1.18 mm. Beak: III, 0.21 mm.; IV, 0.17 mm.; V, 0.085 mm. Total length 1.78 mm. Length of hind tibiæ 1.46 mm. Hind tarsus 0.37 mm.

*Alate viviparous female.*—Antennæ with basal two-thirds of third segment light-coloured remaining part of third and all of the other segments dusky. Legs alike in colouring with basal portions of the femora and tibiæ except the joints light coloured, remaining portions dusky. Cauda and anal plate dusky to black. Antennæ with third segment shorter than the fourth, fifth and sixth together. Fourth segment shorter than the sixth. Third segment with six to eight large, round sensoria, fourth with one or two, and fifth with two. Beak reaching slightly beyond the nectaries, in normal specimens. In specimens somewhat shrunken it appears to reach to the tip of the abdomen. Nectaries large and broadly cone-shaped.

*Measurements.*—Length of body 2.26 mm. Length of antennal segments: III, 0.52 mm.; IV, 0.18 mm.; V, 0.27 mm.; VI, 0.21 mm. Total length 1.28 mm. Beak: III, 0.21 mm.; IV, 0.166 mm.; V, 0.083 mm. Total length 1.97 mm. Length of hind tibiæ 1.84 mm.

### Lachniella gracilis, n. sp.

From a slide containing one apterous and two alate specimens collected by Theo. Pergande in the District of Columbia, May 27, 1894, on *Pinus inops.* Pergande applied the name here given, and it has been retained for that reason. Other slides in the material appear to be the same species, but in this case it seemed best to use but the one slide in setting this type. Types in the U. S. Bureau of Entomology collection.

*Apterous viviparous female.*—Antennæ light at the base and shading to dusky at the tip. Front and middle pair of legs light coloured except at the joints, third pair black except a small area just beyond the base. Cauda dusky to black. Third antennal segment approximately equal to the length of the fourth, fifth and sixth segments together. Fourth and fifth segments approximately equal in length, and the sixth shorter than the fourth. Third segment without sensoria although a single small one was observed on other specimens, fourth segment with one or two sensoria and the fifth with two nectaries cone-shaped, and unusually large. Cauda rather more angular than rounded, but with a widely rounded tip. Hairs short and much more inconspicuous at the base of the tibiæ than at the tip. Hairs at the base distinctly upstanding, those toward the distal end semi-erect.

*Measurements.*—Length of body 3.25 mm. Length of antennal segments: III, 0.46 mm.; IV, 0.21 mm.; V, 0.21 mm.; VI, 0.145 mm. Total length 1.22 mm. Beak: III, 0.25 mm.; IV, 0.187 mm.; V, 0.063 mm. Total length 1.86 mm. Length of hind tibiæ 2.45 mm. Length of hind tarsus 0.31 mm.

*Alate viviparous female.*—Antennæ light at the base of the third segment,

but dusky at the tip and shading into colour of other segments, the last one being nearly black. First and second pair of legs dark to black, except the greater portion of the tibiæ. Hind legs almost black throughout except a small, dusky area near the base. Antennal segments as in the apterous forms, except that the fifth segment is longer than the fourth. Third segment with six, the fourth with two or three, and the fifth with two large sensoria. The sensoria are unusually large as in the apterous forms, and are volcanic in shape rather than cone-shaped. The legs and antennæ are quite hairy, and those of the base of the tibiæ are upstanding while those farther outward are inclined. Cauda angular but broadly rounded at the tip.

*Measurements.*—Length of body 3.88 mm. Length of antennal segments: III, 0.52 mm.; IV, 0.187 mm.; V, 0.23 mm.; VI, 0.166 mm. Total length 1.2 mm. Beak: III, 0.21 mm.; IV, 0.175 mm.; V, 0.063 mm. Total length 1.9 mm. Length of hind tibiæ 2.42 mm.; hind tarsus 0.31 mm.

### Lachniella pacifica, n. sp.

From materal bearing accession numbers of A. D. Hopkins and Theo. Pergande, collected at Eureka, California, May 19, 1903, on *Abies grandis*. Three alate specimens, several pupæ and one apterous specimen in poor condition. However, general characters of species quite distinct. Types in U. S. Bureau of Entomology collection.

*Alate viviparous female.*—In balsam the legs appear to have been fairly dusky throughout, although the hind pair are much darker than the others. Hind tibiæ with only a faint indication of the usually light area near the base of the tibiæ. Antennæ rather stout, third segment with seven to nine large sensoria, fourth with three and fifth with two. Nectaries mostly obscured but appear to be small and having a comparatively small base. Antennæ, legs and body with short hairs of rather fine texture. On the femora and base of the tibiæ they stand erect, while toward the tip of the latter they are inclined.

*Measurements.*—Length of body 1.86 mm.? Length of antennal segments: III, 0.41 mm.; IV, 0.166 mm.; V, 0.187 mm.; VI, 0.12 mm.? Total length 1.04 mm.? Beak: III, 0.187 mm.; IV, 0.145 mm.; V, 0.063 mm. Total length 1.78 mm. Length of hind tibiæ 1.86 mm.; tarsus 0.31 mm.

### Lachniella atlantica, n. sp

From material collected by L. C. Bragg, at Webster, Massachusetts, June 19, 1909, on Pinus sp. Two slides containing three alate and five apterous forms. One slide in writer's collection, others in collection of C. P. Gillette.

*Apterous viviparous female.*—Antennæ light at base of third segment, remaining parts dusky black. All three pairs of legs black except the base of the femora, and a yellow area toward the base of each tibia. Third antennal segment approximately equal in length to the fourth and fifth together. Fourth segment slightly shorter than the fifth, and the sixth shorter than the fourth. Third segment with a single sensoria, fourth with one and fifth with two. Beak extending to the tip of the abdomen. Nectaries extremely large, volcano-shaped.

*Measurements.*– Length of body 2.37 mm. Length of antennal segments: III, 0.44 mm.; IV, 0.21 mm.; V, 0.23 mm.; VI, 0.166 mm. Total length 1.25 mm. Beak: III, 0.21 mm.; IV, 0.187 mm.; V, 0.063 mm. Total length 2.04 mm. Length of hind tibia 2.20 mm. Hind tarsus 0.31 mm.

*Alate viviparous female.*—Colour of antennæ and legs as in the apterous form. Third antennal segment approximately equal in length to fourth. Third antennal segment approximately equal in length to fourth. Third segment with six to eight large, circular sensoria, fourth with two and fifth with two. Nectaries extremely large. Beak extending to the base of the nectaries. Hairs on legs, body and antennæ fairly abundant and longer than those of other species in this group. Those on the femora and at the base of the tibiæ are not quite as upstanding as with other species in this group.

*Measurements.*—Length of body 2.39 mm. Length of antennal segments: III, 0.46 mm.; IV, 0.21 mm.; V, 0.23 mm.; VI, 0.145 mm. Total length 1.28 mm. Beak: III, 0.21 mm.; IV, 0.187 mm.; V, 0.063 mm. Total length 2 mm. Length of hind tibiæ 2.08 mm. Hind tarsus 0.33 mm.

### Lachniella arizonica, n. sp.

Descriptions made from eleven specimens on three slides. Specimens collected on Pinus sp. at Williams, Arizona, June, 1901, by E. Q. Schwarz. Types in U. S. Bureau of Entomology collection.

*Apterous viviparous female.*—General colour characteristics cannot be determined. Antennæ with basal half of third segment light coloured, remaining segments dusky to black. Legs black, except bases of femora, and a small section of the tibiæ near their bases.

Antennæ extending to the third pair of coxæ, the third segment longer than the fourth, fifth and sixth together. Third segment with one to three small sensoria near the distal end. Nectaries large and with a wide, cone-shaped base. This species is entirely different from all other lachnids I have seen because the surface of the body is reticulated, and the spines on the antennæ, body and legs, except on the tarsi and caudal plate, have the appearance of being capitate.

*Measurements.*—Length of body 5 to 6 mm. Width 3 mm. Length of antennal segments: III, 0.96 mm.; IV, 0.35 mm.; V, 0.27 mm.; VI, 0.17 mm. Total of beak 1.7 mm. Length of hind tibiæ 5.12 mm.

*Alate viviparous female.*—Colour characteristics cannot be determined. Dark and light coloration of antennæ and legs as in the apterous forms. Antennæ reaching to base of third pair of coxæ. Third segment about equal in length to the fourth, fifth and sixth segments, and with from two to four irregular-sized sensoria along the distal half. Fourth with two, and fifth normally with two. Body does not show reticulations as in apterous forms, but the hairs are similar and are strongly spine-like.

*Measurements.*—Length of body 5 to 6 mm. Length of antennal segments: III, 0.9 mm.; IV, 0.39 mm.; V, 0.37 mm.; VI, 0.166 mm. Total length 1.98 mm. Length of beak 1.9 mm. Length of hind tibiæ 5.2 mm. Cauda broad and rounded at the tip.

(To be continued.)

## RECENT CANADIAN PUBLICATIONS.

(Continued from Vol. L, p. 427).

CANADIAN BARK-BEETLES. PART II—A PRELIMINARY CLASSIFICATION WITH AN ACCOUNT OF THE HABITS, INJURIES AND MEANS OF CONTROL. By J. M. Swaine. Bulletin No. 14 (Technical Bulletin) Dept. of Agriculture, Entomological Branch, Ottawa. Issued Sept. 6, 1918. 143 pp. 31 pls.

It is only within comparatively recent years that the importance of the Bark-beetles as enemies of North American forests has been fully appreciated even by the forest entomologist. Every year the necessity of stricter economy in the conservation and utilization of our forests becomes more urgent, and it is, therefore, fortunate that we have in Canada so able an authority as Mr. Swaine as a source of information, both practical and scientific, on this group of depredators.

The first part of this bulletin, which was published in 1917, contains descriptions of a large number of new species of bark-beetles. The second part treats of their habits, bionomics and classification, as stated in the title, and has been prepared with the object of enabling students and practical foresters to identify the Canadian species of this group of insects. It is divided into four sections, the first entitled "The Beetles and their Habits;" the second, "Bark-beetle Injuries and the Means of Control;" the third, "Structural Characters of the Bark-beetles," and the fourth, "Classification. A Preliminary Arrangement of the Canadian Bark-beetles."

Section 1 is an admirable account of the general life-history of these insects, based upon an intimate first-hand knowledge of a great variety of species. The different types of egg tunnels, larval mines, methods of oviposition, and other details of their habits are described with conciseness and precision. Among other interesting features in this section are the statements that the so-called ventilation tunnels are used mainly as turning-niches by the females during oviposition and as storage places for boring dust and that the nuptial chambers are used by some species for the same purposes.

In Section II the species of bark-beetles are grouped under three headings, primary enemies, secondary enemies and neutral species. Primary enemies are those species which commonly attack and kill healthy trees, the most important of these being certain large forms belonging to the genus Dendroctonus. Secondary enemies are those species which habitually breed in the bark of dying trees and logs, but these are frequently injurious in that they kill weakened trees which might otherwise recover. Secondary enemies may become of primary importance under conditions favourable for their rapid reproduction, as in the case of various species of Ips. All of the Canadian species under normal conditions seem to prefer to breed in dying or weakened trees. Some of the twig-boring species may be abundant enough to cause some injury, while others may be actually beneficial by hastening the death of the lower branches of pines and spruces, thus helping to produce cleaner trunks. The neutral species are of no economic importance as they breed only in dying or dead bark.

Attention is called to the effect which neglected slashings produce in increasing the number of scattered dying trees in the vicinity on account of the favourable conditions thus brought about for the breeding of bark-beetles.

These conditions are frequently the cause of outbreaks of one or more species, which may be local (sporadic) or more general (epidemic) according to the nature of the species of beetle involved in the attack. At the present time outbreaks of a serious character are still in progress in certain parts of British Columbia, caused by two species of Dendroctonus, the Western Pine Bark-beetle (*D. brevicomis* Lec.) and the Western White Pine Bark-beetle (*D. monticolæ* Hopk.). Both of these species are destroying yellow pine in Southern British Columbia, while the latter species is also attacking western white pine and lodgepole pine.

Various other conditions favouring bark-beetle outbreaks also described in this section, followed by an account of the natural factors and artificial methods of control.

The greater part of the bulletin, constituting Section III and IV is devoted to the taxonomy and systematic treatment of the species. The external structures, in so far as they are of value in the determination of genera and species, are described in detail, but the internal characters are omitted, as they are useful only to the expert.

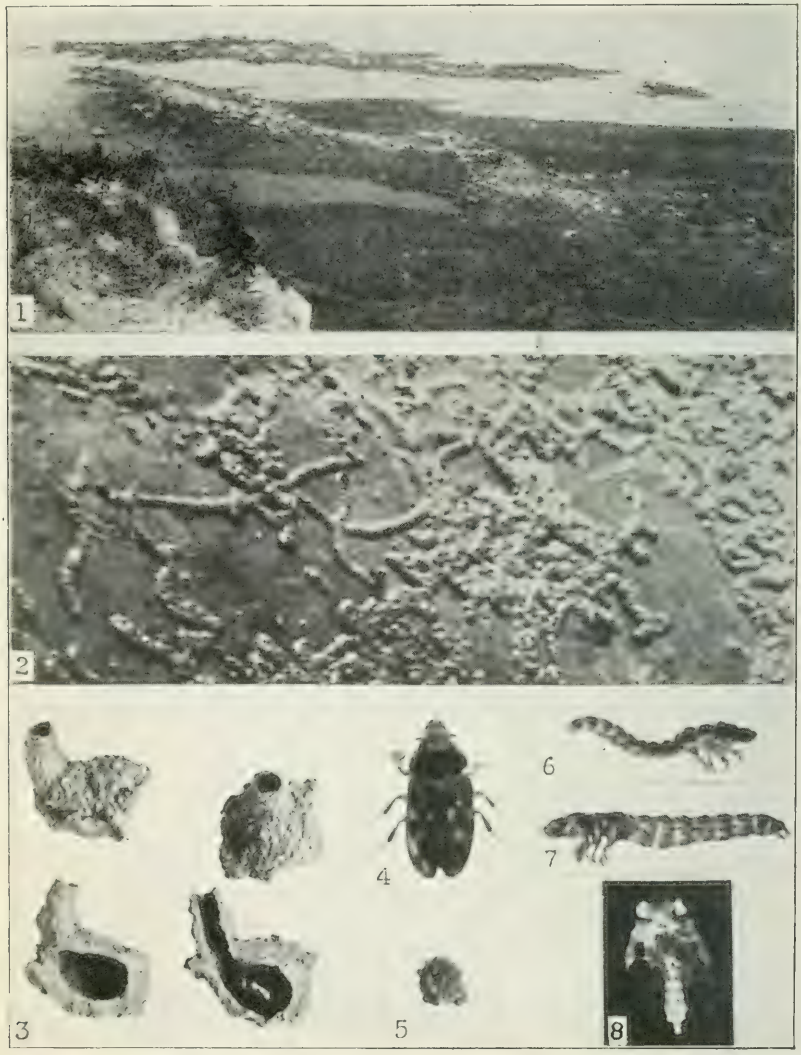
The bark-beetles constitute the superfamily Ipoidea (Scolytoidea), all the Canadian species except one (*Platypus wilsoni* Sw., fam. Platypodidæ) belonging to the family Ipidæ. Keys for the separation of the families, subfamilies, genera and species are given, and not only all the Canadian species but also the majority of those found in the Northern United States are included, as many of the latter may eventually be discovered in Canada.

In the detailed account of the species, descriptive notes or full descriptions are given when necessary, with the names of the host tree and a brief statement of the geographical distribution. Ten new species are described, and 135 species are definitely recorded from Canada.

The illustrations are beyond criticism. There are 31 plates, the great majority being heliotype reproductions of photographs and drawings by Mr. A. E. Kellett. The drawings are second to none we have ever seen, and the beauty of their general appearance is in no way marred by the extraordinary minuteness with every detail is rendered. The photographs, showing the tunnels in the bark and wood and other features of the work of the beetles and their larvæ are likewise extremely fine.

Altogether this remarkable work deserves very special praise. It is one of the finest contributions to Canadian entomology that has ever been published, and great credit is due to the author, the artist and the Dominion Entomological Service.

Mailed January 28th, 1919.




## THE HABITS OF HETEROCERUS BEETLES.

1. Mud bar where the beetles breed. 2. Burrows made by the larvæ. 3. Pupal cases. 4. Adult. 5. Eggs. 6. Larva. 7. Larva ready to pupate. 8. Pupa.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### NOTES ON THE HABITS OF HETEROCERUS BEETLES.

BY G. B. CLAYCOMB, UNIVERSITY OF ILLINOIS, URBANA, ILL.

In the hot, dry days of summer, when the creeks run low and the mud bars become numerous along the margins of the streams, a common sight on this recently deposited mud is the network of lines which mark and ramify the surface. Investigation shows clearly that some small animal has pushed its way through the soft alluvium and formed little tunnels in the freshly exposed sediment left by the receding water. These little subterranean passages were a source of great perplexity to the writer until the summer of 1916, when the entire mystery was revealed as if by magic.

Along a small creek in western Illinois on a day late in July, the entire life-history of the little builder of the burrow was found in all completeness. Near the water (pl. I, fig. 1), just beneath the surface of the soft squashy mud, were the tunnels, freshly made. Farther back on the dryer portion of the bar, the tunnels were more numerous and the elevation of the soil which marked the passages was more distinct, due to the drying of the earth. Still farther back the lines formed, in places, an almost unbroken mat, so extensive had the network become (pl. I, fig. 2). On the higher, firmer portions of the deposit, among the older less distinct galleries, were little cases with chimney-like extensions projecting from the mud (fig. 3).

Here then was the life-history of these interesting beetles in all its completeness within this very limited area. The adult beetle (fig. 4) was found to be the maker of the tunnels in the fresh mud near the water. Several were captured within the burrows, and others, when disturbed, forced their way out through the mud and flew away. In these newly constructed passages are laid the eggs in small masses (fig. 5). The eggs hatch into active running larvæ (fig. 6) which greatly extend the home already started for them by the adult, growing to a length of 7 or 8 millimetres, the larvæ construct for themselves the mud chambers with the peculiar little chimneys extending upward from them (fig. 3) The openings of these chimneys are usually closed near the top by a very thin layer of dry mud. These structures become firm and strong after they are dry. In the chamber the larva changes to a pupa (fig. 8). Beside the larvæ and pupæ, several adults were found within the cells (fig. 3).

The beetles were identified for me by Mr. A. B. Walcott, of The Field Museum of Natural History, Chicago, who says: "The sending represents two species, the larger and paler ones are *Heterocerus pallidus* Say; while the smaller and darker ones are *Heterocerus tristis* Mann." The adults of these two distinct species were found together in the same limited area and in the same kind of pupal cases. Their habits apparently are identical.

The smaller beetles measured on an average 4.3 mm. in length, the larger ones were slightly longer. At the time of pupation the larvæ measured from 7 to 8 mm. in length (fig. 7). The cases averaged 10 mm. in their longest dimension.

When the place was visited again a few days later, a rise of the stream had obliterated the entire colony, and nothing remained but a plain mud bar.

## NEW AND LITTLE-KNOWN AMERICAN BEES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

The new species described all belong to parasitic genera.

### Cœlioxys panamensis, n. sp.

♂. Length about 10 mm.; black, with the legs (except coxæ), tegulæ, first abdominal segment and second laterally all bright ferruginous, under side of abdomen darker red; mandibles reddish in middle; face and front densely covered with appressed, very pale, yellow hair; eyes pale reddish, with short hair; antennæ black, with penultimate joint (except dusky apex) and basal half of last joint dull yellowish red; third joint conspicuously shorter than fourth; vertex densely punctured, but a smooth area at each side of the ocelli; mesothorax densely and coarsely punctured, the anterior margin with a bow-shaped band of pale fulvous hair; a band of similar hair posteriorly, partly on mesothorax and partly on scutellum, and a spot at each side behind the tegulæ; axillar spines long, flattened, appearing slender from above; scutellum densely and coarsely punctured, with a median carina, but no projecting tooth; mesopleura with a broad band of white hair in front and behind; wings strongly brownish; first r.n, jointing second s.m. nearly as far from base as second from apex; anterior coxæ with short, flattened spines; abdomen dorsally finely punctured, shining; hair-bands slender, tinged with yellowish; apex with slender lateral spines; slender, widely divergent, inferior apical spines; and broad, obtuse superior apical lobes, shorter than the inferior spines.

Canal Zone, Panama (*A. H. Jennings*), U. S. National Museum. Not closely related to any species known to me; in my table of males it runs near *C. sayi* and *C. hirsutissima*. The peculiarly coloured antennæ are quite distinctive.

### Cœlioxys nigrofimbriata, n. sp.

♀. Length about 9.5 mm.; black, with the tegulæ and legs ferruginous; the abdomen is entirely black above, but dark red (with white hair bands) beneath; antennæ entirely black; mandibles red, black at apex; face covered with erect brown hair, but the sides with white tomentum; clypeus simple; eyes red, with short hair; mesothorax surrounded with pale fulvous hair; mesothorax and scutellum with very large punctures, but the shining intervals conspicuous on disc; scutellum with a smooth median keel; axillar spines rather short, curved; wings strongly brownish; recurrent nervures equally distant from ends of second s.m.; anterior coxæ with short spines; abdomen above highly polished, sparsely punctured, with very narrow whitish hair-bands; sixth segment with very minute punctures, and a median keel; last ventral segment produced far beyond last dorsal, sharply pointed at end, not notched at sides, but densely fringed with black hair; apex of last dorsal also with black hair, but its sides before apical part fringed with white hair.

Manaos, Brazil, (*Miss H. B. Merrill*), U. S. Nat. Museum. In Schrottky's table of Brazilian species this runs to *C. amazonica* Sky., but is smaller, and apparently less densely punctured on thorax above. Schrottky also omits to refer to the more striking characters of the abdomen, present in our species, and presumably absent in his. In the tables of Holmberg and Friese it runs nearest to *C. remissa* Holmbg., but differs in the sculpture of the scutellum.

**Cœlioxys clypeata** Smith, variety a.

♀.—First abdominal segment red above. The pubescence of the large clypeal lobes is reddish.

Trinidad, West Indies, June, (*Aug. Busck*). U. S. Nat. Museum.

**Cœlioxys deplanata** Cresson.

♀.—Tlahualilo, Mexico, July, 1905, (*A. W. Morrill.*)

**Cœlioxys crassula,** n. sp.

♀.—Length about 8.5 mm.; black, robust, with the legs (except coxæ and trochanters) and tegulæ ferruginous; mandibles black; clypeus simple, short and very densely punctured; antennæ black, third joint about as long as fourth; eyes black or almost (not greenish or reddish); vertex with a smooth space on each side next to eye; pubescence dull white, the abdomen with five entire bands, but no short, oblique ones; mesothorax and scutellum with dense large punctures, the latter with posterior margin straight; axillar spines moderate; wings dusky; anterior coxæ with small spines; abdomen very broad at base, well punctured; apical dorsal segment keeled its whole length, ending with an angle of perhaps 60 degrees; apical ventral segment broad, not much turned downward at sides before end, the outer margin of the notch sharp.

Boulder, Colorado, in D. M. Andrew's nursery, at flowers of cultivated *Helenium*, Oct. 10, 1918. (*W. P. Cockerell*). In Crawford's table this runs exactly to *C. octodentata* Say, but it differs by the entire keel on last dorsal segment, shorter last ventral segment, and colour of eyes. On the same flowers, at the same time, were males of *Melissodes semiagilis* (Ckll.). On Oct. 12, the weather being unusually fine and warm for the time of year, I went to the same spot in search of more *C. crassula*. I did not find any, but from the *Helenium* I obtained females of *Megachile brevis* Say, and males of *Halictus armaticeps* Cresson and *Colletes salicicola geranii* Ckll. I also collected a male *Megachile perihirta* Ckll. Immediately adjacent was a row of *Salvia pitcheri*, which was visited by *Bombus americanorum* Fabr., *Anthophora smithii* Cresson, *Pseudomelecta interrupta rociadensis* Ckll., and *Sphecodes lautipennis* Ckll.

**Stelis aliena,** n. sp.

♀.—Length about 8.5 mm.; with the general appearance, venation and pulvilli of *Dianthidium* (e. g., *D. bicoloratum* Smith), but no scopa, the ventral abdominal segments with thin fringes of hair; cheeks, vertex, occiput and mandibles (except teeth) bright ferruginous; two very broad black bands, beginning between the ocelli, pass down the front to the clypeus, where they become narrower; between these is a red band, the upper end of which (marked off from the red by a constriction) is orange; between the black bands and the eyes, down to the clypeus, is orange suffused with red; clypeus reddish black, the lower corners red; antennæ red; head very densely punctured throughout, as also the thorax, the punctures of scutellum much larger than those of mesothorax; prothorax black, the tubercles with an orange spot; pleura black, with thin white hair, its upper part mainly occupied by a large red patch; mesothorax black in middle, laterally dull red, shading into black at sides, but lateral and anterior margins yellow, except middle of anterior margin, the yellow anteriorly forming triangular patches, which are extended

as orange lines across the disc between the black and red areas; axillæ yellow; scutellum bright red, prominent; metathorax black; tegulæ red, very finely punctured; wings fuliginous; legs red, hind femora suffused with blackish; abdomen black, with an interrupted yellow band on first segment, and four yellow spots each on second to fifth; the broad apical segment wholly black; first three segments shining and rather sparsely punctured, the others with large dense punctures.

San Bernardino, Paraguay, (*K. Fiebrig*). U. S. Nat. Museum. This is the first recognized South American *Stelis*, and from its resemblance to the species of *Dianthidium* of the same general region, it seems possible that it represents an independent development, not derived from the *Stelis* of the Northern Hemisphere. *Dianthidium nudum* Schrottky appears to be congeneric, and may be called *Stelis nuda*.

**Dianthidium bicoloratum** (Smith).

Male.—Clypeus yellow, greater part of mesopleura and hind margins of first four abdominal segments red. Carcarana, Argentina (*Bruner* 18).

**Dianthidium multifasciatum** (Strand).

San Bernardino, Paraguay (*K. Fiebrig*).

*Erratum.* Can. Ent., p. 349. For *Nescorynura* read *Neocorynura*.

## SOME NEW OR SCARCE COLEOPTERA FROM WESTERN AND SOUTHERN FLORIDA—II.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

(Continued from Vol. L., p. 424.)

**Mycetophagus pini** Zieg.—Three examples of what I take to be this uniform fuscous-brown species were taken at Dunedin in December. They were found on different occasions, two in fleshy fungi, the other by beating dead branches. Col. Casey, who has examined one of them, is inclined to doubt its being *pini*, stating that "they are not so elongate as that species and the antennal structure appears to be different." They accord, however, with all the brief descriptions of *pini*, the type of which was from North Carolina. No species of *Mycetophagus* has before been recorded from Florida.

**Hister cœnosus** Ehr.—This large well-marked *Hister* is recorded by Schwarz as "common in Northern Florida," but no records for the southern half of the State are known. Two specimens were taken at Dunedin, on Dec. 19 and March 29, respectively, both being sifted from carrion traps.

**Hister lecontei** Mars.—This widely distributed species does not seem to be previously known from Florida, at least no published record can be found. A single specimen was taken from beneath the lake beach debris near Moore Haven on March 3.

**Hister coarctatus** Lec.—Horn in his "Synopsis of U. S. Histeridæ"* says that this species occurs with *H. parallelus* Say, the latter having been previously mentioned by him as "occurring in Georgia, South Carolina and Florida." This indirect record is the only one I can find for Florida. A single

*Proc. Amer. Phil. Soc., XIII, 1873, 298.

specimen was taken at Dunedin on March 25 while sweeping huckleberry and other low vegetation.

**Soronia undulata** Say.—A specimen was given me by Dr. E. W. Berger, Entomologist of the Florida State Plant Board, who reared it from larvæ sent in to him as damaging the fruit of guavas at Bradentown. It has not before been recorded from the State. Horn* gives its range as Middle States to Utah.

**Cryptarcha strigata** Fab.—An introduced European species not before reported from Florida. Two specimens were taken, one at Dunedin, February 11, while beating, the other at La Belle, February 27, by sweeping.

**Trogosita hubbardi** Leveille.—A submaritime species described from Biscayne Bay, and since taken by Schwarz (Ms.) at Key West and Punta Gorda, Fla., and Cayamas, Cuba. Two specimens were beaten from Florida button-bush, on Hog Island, March 14.

**Elater manipularis** Cand.—LeConte gives** the range of this species as "Canada to Texas." I can find no record of its occurrence in Florida. Two specimens were taken at Dunedin in December, and one at Lakeland, Feb. 22, all by beating bunches of Spanish moss in which they were hibernating.

**Dicerca punctulata** Schön.—One specimen beaten from pine at Dunedin, Jan. 15. LeConte, in his Revision, gives its range as New York to Georgia. Not mentioned in any of the Florida lists.

**Mastogenius subcyaneus** Lec.—Several specimens of this small Buprestid are taken at Dunedin each spring by sweeping ferns and beating in Skinner's Hammock. I have also taken it at Eustis. Schwarz (Ms.) notes it from St. Augustine. There is no previous published record for the State.

**Agrilus floridanus** Cr.—A half dozen specimens of this handsome bronzed species were swept from huckleberry and other low shrubs at Dunedin during the latter part of March. It was described from northern Florida and is recorded elsewhere only from Tampa.

**Agrilus cupricollis** Gory.—This species was described from St. Augustine and has been taken by me at Ormond and Dunedin. At the latter place it begins to appear about March 10 and occurs on huckleberry and other low shrubs.

**Taphrocerus albonotatus** sp. nov.—Elongate, slender, strongly tapering behind. Black, shining, very sparsely and finely pubescent; the elytra with eight isolated white pubescent spots, arranged in three cross rows, two each in the first and third, and four in the second or middle row; the spots of the third row crescent-shaped, the others rounded or oblong, the first row at middle, the others equally spaced behind it. Head as broad as front of thorax, finely alutaceous, not punctate, the occiput with a wide, shallow, median impression. Thorax twice as wide as long, base slightly wider than apex, disk uneven, but less so than in *gracilis;* surface minutely alutaceous and with large, shallow, scattered ocellate punctures. Elytra at base slightly narrower than base of thorax, sides broadly sinuate in front of middle, straight and strongly converging from apical third to the obtusely rounded tips; disk with irregular rows of large shallow punctures, these becoming obsolete towards apex. Abdomen with

*Trans. Amer. Ent. Soc., VII, 308.
**Trans. Amer. Ent. Soc., XII, 1884, 9.

large, very shallow punctures, each enclosing a small oblong white scale. Length 3.5—4.5 mm.

Frequent in southern Florida, on huckleberry and other low shrubs in late fall and early spring. Taken by me at Lakeland, Ft. Myers, La Belle and Dunedin, October 20 to April 10. Confused heretofore with *T. gracilis* Say from which it differs by its more slender and more strongly tapering body, black colour without bronze tinge as in *gracilis*, and by the isolated white pubescent spots, the pubescence in *gracilis* coalescing to form two white cross bars on apical half of elytra. *T. puncticollis* Sz. is distinct by the punctate head and lack of elytral pubescent spots or bands. It has been taken by me at Okeechobee City, Bassenger and Dunedin.

**Taphrocerus agriloides** Crotch.—A half dozen specimens of this scarce form were taken near Moore Haven by sweeping low vegetation along the margin of Lake Okeechobee. It was described from Texas and is recorded by Schwarz as very rare at Haulover, Fla.

**Brachys lugubris*** Lec.—This name should be replaced in our lists either as a valid species or a well marked variety of *B. ovata* Web. The surface is black with a bluish tinge, never bronzed, the pubescence always white. The last ventral of male is not visible from above as in *ovata*, and its marginal teeth are much finer. In the female this segment is not truncate, as stated by Le Conte, but broadly rounded. About Dunedin it was swept from Ericads and low vegetation along the borders of lakes on several occasions in February and March, and was also taken under like conditions at Lakeland.

**Calochromus perfacetus** Say.—Two specimens of this Lampyrid were taken at Lakeland on Feb. 21. It was also found by me at Ormond on April 14. LeConte, in his synopsis of the family, gives its range as "Atlantic States," but this is the first record from Florida.

**Chauliognathus pennsylvanicus** DeG.—This species, whose general range is more northern than that of *C. marginatus*, was taken at La Belle on Feb. 27. It is mentioned in Schwarz's manuscript list as occurring at St. Augustine and Cresent City.

**Phengodes floridensis** sp. nov.—Elongate, slender. Pale reddish yellow, pubescent with yellow hairs; antennæ, except the two basal joints, apical or narrowed halves of elytra, inner wings and margins of dorsal segments of abdomen, fuscous. Head with deep transverse curved channel behind the eyes, the latter globose, prominent; occiput and front densely punctate, not grooved lengthwise; antennæ strongly plumose, half the length of body. Thorax slightly wider than long, convex, front angles rounded, hind ones acute, side margins flattened, horizontal, slightly narrowed in front, disk very finely and sparsely punctate. Elytra subulate, reaching scarcely beyond base of abdomen. Length 9 mm.

One male, swept from ferns in Skinner's Hammock northeast of Dunedin, March 19.

**Eupactus obsoletus** Fall.—A specimen taken at electric porch-light at Dunedin was received on June 15. Identified by Mr. Fall, who states that it has

*Trans. Amer. Phil. Soc., XI, 1859, 251.

not previously been reported from Florida. *E. punctulatus* Lec. has also been taken at light at Dunedin.

**Copris inemarginatus** Blatch.—An examination of the male genitalia of this species and of *C. anaglypticus* was kindly made for me by Prof. R. W. Dawson of Lincoln, Neb. He reports that the claspers are uniformly less elongate and less slender in *inemarginatus* than in *C. anaglypticus*. He examined also the genitalia of other species of *Copris*, viz., *mæchus minutus* and three tropical forms, and states that "the differences between the genitalia of these unquestionably distinct species are little if any greater than those between *inemarginatus* and *anaglypticus*." His conclusions therefore are but additional evidence that the Florida form was worthy of a distinctive name*.

**Onthophagus alutaceus** sp. nov. —Rounded-oval, small for the genus. Black, feebly shining, not at all bronzed; palpi, tarsi and front tibiæ brownish. Head of male without carina, sparsely punctate above, more closely near the margins, the clypeus with a broad, rather shallow triangular notch. Thorax twice as wide as long, longest at middle; sides straight in front, then rounded into base, the latter broadly rounded, sinuate near hind angles, distinctly margined; disk strongly convex, its front third declivent and with an obtuse triangular median projection; surface finely alutaceous, sparsely, evenly, coarsely and shallowly punctate, each puncture bearing a short, coarse, stiff, erect, brown hair. Elytra at base distinctly narrower than middle of thorax; striæ very fine; intervals wide, coarsely alutaceous, each with two rows of fine, aciculate punctures, each puncture bearing a fine, short, inclined yellow hair. Spur of hind tibiæ half the length of tarsi. Pygidium, femora and sterna coarsely, shallowly and sparsely punctate; abdomen almost smooth. Length 4 mm.

One male, taken on the wing at Dunedin, Jan. 7. Chas. Schaeffer, who recently published a review of the North American species of *Onthophagus*,** says it is undescribed form, close to a new species in his collection from Texas, which has the front tibiæ armed with a distinct, moderately long hairy pencil as in "*anthracinus*, *landolti*, etc.," this being absent in the Florida specimen. The broad, strongly alutaceous elytral intervals with rows of aciculate punctures resembling minute tubercles, taken in connection with the small size, black colour and notched clypeus, are the principal distinctive characters of *alutaceus*. It is closely related to *cribricollis* Horn, the latter being bronzed, with different sculpture of upper surface and broader clypeal notch.

**Aphodius bicolor** Say.—One specimen taken at Dunedin, March 18. The first record for the State.

**Polyphylla occidentalis** Linn.—One specimen taken at porch-light at Dunedin, June 10. Specimens in the Gainesville collection are from Lake City. The *P. occidentalis* of the Schwarz List was based on *P. gracilis*, there being no published record of true *occidentalis* from the State.

*In the last paragraph of the notes following the description of *C. inemarginatus* (Can. Ent., February, 1918), line 8 from the bottom of p. 55 should read "and take the punctures out of" instead of "and put the punctures in."

**Journ. N. Y. Ent. Soc., XXII, 1914, 290.

**Heterachthes pallidum** Hald.—Elongate, slender, cylindrical. Rather dark reddish brown or rufo-testaceous throughout, strongly shining. Thorax cylindrical, twice as long as broad, narrowed at base, finely, sparsely and irregularly punctate without callosities or antemedian constriction as in *quadrimaculatus*. Elytra twice as long as thorax, slightly wider at base, finely sparsely and irregularly punctate, each puncture bearing a very slender, erect hair. Under surface smooth, glabrous. Length 6.5 mm.

The above description, I take it, is that of the insect mentioned* as a variety of *H. quadrimaculatus* Newm., Haldeman's brief description following that of *H. quadrimaculatus*, being as follows: "Var. *pallidum*. Pale, posterior spots wanting. Three lines long." As described above the differences between the two forms are sufficient to restore Haldeman's name, if not as a valid species, at least as a good variety. One male was taken by beating in Skinner's Hammock northeast of Dunedin, March 23. The antennæ, as is usual with males of the genus, have joints 1 to 6 uniformly thickened, the second very small, globular; the terminal joints much more slender. *H. ebenus*, the only other species known from Florida, was taken at Moore Haven and Okeechobee City.

(To be continued)

## THE NORTH AMERICAN DIPTERA DESCRIBED BY NILS S. SWEDERUS.

BY CHARLES W. JOHNSON, BOSTON, MASS.

In Kongl. Vetenskaps Academiens Nya Handlingar, 1787, vol. VIII, pt. 4, Swederus described seven Diptera, including two from North America. The author states that he has followed the classification of Linné, the genera of Fabricius being placed in parenthesis. On page 287 is described *Musca* (*Syrphus* Fabr.) *monoculus*, "Hab. in America Septentrionali." I am unable to identify this species. On page 288, *Musca* (*Syrphus* Fabr.) *americana* is described, "Hab. in America Sept." This is probably the species referred to as "*Musca tomentosa* Swederus" in Osten Sacken's Catl. N. Amer. Diptera, page 136, 1878, in the synonymy under "*Brachypalpus verbosus* (Harris) Walker," and later placed in the synonymy under *Criorhina verbosa* by Williston (Synopsis N. Amer. Syrphidæ, page 211, 1886). The name "*Musca tomentosa* Swederus" is evidently an error, as no species by that name was described by him. In regard to *Musca* (*Syrphus*) *americana* Swederus being the same as *C. verbosa* Walker, there seems to be too many discrepancies, the description agreeing far better with *Eristalis flavipes* Walker.

The name *Musca americana* was previously used by Fabricius 1775. On the other hand, *Syrphus americanus* was used by Wiedemann in 1830. Does the use of Fabricius' genus in parenthesis by Swederus invalidate the name used by Wiedemann? I am inclined to think it does, as the author's intention seems very clear, for, following this description, three other species are described in which only the genus *Musca* is used. To avoid confusion it seems necessary to rename Wiedemann's species. I, therefore, propose the name *Syrphus wiedemanni* n. n., placing *Musca* (*Syrphus*) *americana* Swederus in the synonymy under *Eristalis flavipes* Walker.

*Trans. Amer. Phil. Soc., X, 1847, 43.

# LEUCOPELMONUS CONFUSUS, NORTON—TENTHREDINIDÆ.*

BY ALEX. D. MacGILLIVRAY, UNIVERSITY OF ILLINOIS, URBANA, ILL.

Norton in his "Catalogue of the Described Tenthredinidæ and Uroceridæ of North America," describes as a new species, *Tenthredo confusus*. This species was based upon a male received from the Smithsonian Institution. The only locality noted was the United States. The type of this species has been reported as lost and, so far as I am aware, no one has identified this species since.

In the Canadian Entomologist for 1893, Mr. W. Hague Harrington described a peculiar tenthredinid, *Tenthredopsis* (?) *annulicornis*. It is not unusual for species of Ichneumonidæ to have the proximal and distal segments of the antennæ black or dusky and the intermediate segments white. This is the first record of a species of Tenthredinidæ with antennæ coloured in this way. The female of this species has the fifth and sixth segments white and the others dusky. Such an arrangement of colour makes the female very easily recognized.

Mr. S. A Rohwer described a similar species from North Carolina under the name of *Perinura turbata*. The female of this species also has the fifth and sixth segments of the antennæ white.

There is included in my report on the Tenthredinoidea in the report of the Hymenoptera of Connecticut a new genus and species, *Leucopelmonus annulatus*, the female of which has similarly coloured antennæ. This species was based on specimens collected in New England. It was hoped that a careful study of all these species could be made before the description of *L. annulatus* was published, but this was impossible.

The description of Norton was based upon a male, but in the case of the species described by Harrington, Rohwer, and MacGillivray, specimens of both sexes were available for study. There is before me for comparison typical specimens of both sexes of these three latter species. While there are slight individual variations, I am unable to find any constant characters for separating them. The males agree perfectly with Norton's description of the male of *confusus*, and I believe that these four names all apply to a single species which is very constant in its structural and colorational characters.

## **Leucopelmonus** MacG.

1917. MacGillivray, Bul. Conn. Geol. Nat. Hist. Surv., 22, 83.

Head broad between the compound eyes, nearly twice as broad as the eyes are along at the antennal foveæ; compound eyes with their mesal margins nearly parallel or only slightly converging ventrad; antennal plates not strongly developed, but distinct; malar space one-half as long as the first antennal segment; clypeus deeply emarginate, labrum broadly rounded; lateral ocelli slightly dorsad of a line connecting the dorsal corners of the compound eyes; antennæ with nine segments, the first distinctly longer than the second, segments of the flagellum not thickened or clavate; legs with the metacoxæ not reaching to the caudal margin of the third abdominal segment, metafemora not reaching the caudal end of the abdomen, and the claws deeply cleft; front wings with the radial cross-vein, the free parts of $R_4$ and $R_5$, the radio-medial cross-vein, and the free part of $Sc_1$ distinct; $M_{3+4}$ originating from the cell $R_5$ and $M_2$ from the cell $R_4$; 2nd A a short, transverse vein; hind wings with the free part of $R_4$ and

*Contributions from the Entomological Laboratories of the University of Illinois, No. 57.

the transverse part of $M_2$ wanting, the cells $R_3$ and $M_1$ not limited at the margin of the wing by a vein; abdomen with the basal plates not divided at middle.

This genus is related to Tenthredopsis and Rhogogastera, from the former of which it is separated by having the basal plates undivided and from the latter by lacking the free part of $R_4$, and the transverse part of $M_2$ in the hind wings of both sexes.

**Leucopelmonus confusus** Nort.

1869. *Tenthredo*. Norton, Trans. Amer. Entom. Soc., 2, 24.

1887. *Tenthredopsis*, Cresson, Syn. Fam. Gen. Hymen. Amer., 169 *annulicornis* Harrg.

1893. ? *Tenthredopsis*, Harrington, Can. Entom., 25, 61, *turbata* Rohwer.

1911. *Perineura*, Rohwer, Proc. U. S. Nat. Mus., 41, 408, *annulatus* MacG.

1917. *Leucopelmonus*, MacGillivray, Bul. Conn. Geol. Nat. Hist. Surv., 22, 83.

*Female.*—Head, including the clypeus, finely, densely, shallowly punctured; the clypeus narrowly, deeply emarginate, the bottom of the emargination transverse, the sides oblique, the clypeal lobes large, broadly truncated; the antennal furrows broad, deep, and distinct, more linear between the lateral ocelli and the caudal margin of the head, parallel; the caudal portion of the head distinctly margined, deeply interrupted by the antennal furrows; the postocellar area very convex, quadrangular; the ocellar furrow distinct, broadly rounded, connecting with the antennal furrows and a short, interocellar furrow continued as a slight V-shaped depression surrounding the median ocellus; the ocellar areas not elevated adjacent to the lateral ocelli, forming well elevated ridges continuous with the distinct antennal plates and elevated flat supraclypeal area; the median fovea wanting; the dorsal end of the supraclypeal area abrupt, forming the ventral boundary of the deep ocellar basin, extending from the supraclypeal area to the median ocellus, the ocellar basin variable in depth, the ventral portion sometimes smooth; a distinct lateral fovea adjacent to the dorsal end of each antennal plate; the antennæ with the third and fourth segments subequal or the third slightly longer than the fourth, the fourth distinctly longer than the fifth; the pronotum sparsely coarsely punctured; the median and lateral lobes of the mesonotum polished, with sparse punctures bearing setæ; the mesoscutellum and axillæ densely granular, the mesopostscutellum polished with a few punctures, the lateral portions sometimes slightly finely striated; the mesoscutum finely densely granular; the mesopleura with the dorsal portion finely densely punctured, gradually merging with the granular ventral portion and polished mesosternum; metapleura granular; the wings hyaline, the proximal half of the stigma pale, the veins including the costa brownish; the claws cleft, the inner lobe about one-fourth the length of the outer; the cephalic tibial spurs enlarged, angularly bifurcate at the distal end; the abdomen polished, sparsely setaceous; the saw-guides slender, the dorsal margin straight, the ventral margin rounded, continuous with the strongly obliquely convex distal portion, the dorsal and distal margins forming a sharp angle; the distal and ventral margin bearing long setæ; the cerci short and truncate; colour rufous shading to whitish with the following parts black: the first to fourth segments of the antennæ, the distal half or whole of the seventh,

and the eighth and ninth, the head except the supraclypeal area for the most part, the clypeus, the labrum, and some irregular marks on the postocellar area, sometimes represented by two black spots, an oval spot on each lateral lobe of mesonotum and a minute spot near the caudo-mesal angle of each oval spot, the metanotum and the sutures between it and the basal plates and first abdominal segment more or less, the ventral aspect of the mesopleura and metapleura, sometimes with a rufus spot on the mesopleura, variable in size and distinctness, mesosternum and metasternum, the coxæ except the distal portion, and a band at the distal end of the metafemora and metatibiæ; the labrum, antennal segments five and six, sometimes the proximal half of seven and the tegulæ white. Length 8–10 mm.

*Male.*—The male differs only in having a larger proportion of black and in having the rufous colour tending toward white; the antennæ are pale beyond the second segment, rufous or yellowish, the distal segments viewed in certain lights, whitish; the three distal segments of the abdomen usually black, the entire abdomen sometimes rufous; the pronotum in great part black; the mesopleura entirely black. Length 7–8 mm.

*Habitat.*—Ottawa, Ontario, (W. Hague Harrington); North fork of Swanaanoa River, Black Mountains, North Carolina (Nathan Banks and Franklin Sherman); Franconia, New Hampshire (Mrs. A. T. Slosson); Durham, New Hampshire (C. M. Weed); Hampton, New Hampshire (S. Albert Shaw); Ithaca, New York.

## SOME NEW AMERICAN DELPHACIDÆ.

BY F. MUIR, HONOLULU, T. H.

### Genus **Columbiana,** nov.

Head a little narrower than thorax; vertex slightly wider than long, apex slightly narrower than base, basal areas five-sided, nearly the length of the vertex with an oblong foveola in each, the diamond-shape cell small and projecting beyond the apical margin; length of face about twice the width, slightly narrowed between the eyes beyond which the sides parallel, median carina simple, slightly thickened at base; in profile vertex and face rounded; antennæ cylindrical, reaching to apex of face, first joint about as long as broad, second joint about twice the length of first and slightly thicker; clypeus tricarinate. Pronotum tricarinate, lateral carinæ divergingly curved posteriorly not reaching to the hind margin; mesonotum tricarinate. Hind tibia longer than the tarsi, first tarsus equal in length to the two others together; spur slightly shorter than the first tarsus, narrow, cultrate, concave on the inner surface, a tooth on apex but none on the hind margin. Media touching cubitus, a short cross-vein between media and radius.

This genus comes near to *Sogatopsis* Muir; if we disregard the spur it comes near to *Delphacodes* Fieb. and *Sogata* Dist.

**Columbiana lloydi,** sp. nov. Figs. 6-a, 7-a.

Male, macropterous. Castaneous, darker on pro- and mesonota and abdomen. Tegmina hyaline, veins brown with very fine granules, fuscous or brown over the basal half of costal cell and slightly so over clavus, with a darker mark at the apex of claval vein.

Opening of pygofer oblong, the ventral edge produced into three processes, the middle one broad and bifurcate, the lateral smaller and lanceolate; anal segment large without spines; genital styles straight, flat, narrow at apical fourth, apex truncate; aedeagus large, produced into a long, curved narrow apex with a curved spine at base of the narrow apex.

Length 2.6 mm.; tegmen 4 mm.

*Habitat.*—Almaguer Cauca, Columbia, 10,500 feet elevation (Lloyd).

**Pissonotus megalostylus,** sp. nov. Figs. 8-a.

Male, macropterous. Width of head including eyes 1.7 times the length including eyes, antennæ reaching nearly to the apex of clypeus, joints subequal in length, vertex longer than wide, apex slightly narrower than base; lateral pronotal carinæ straight, diverging posteriorly not quite reaching the hind margin; length of hind tibia subequal to tarsi, first tarsus slightly longer than the other two together, spur large, as long as first tarsus, laminate, small teeth on hind margin.

Light brown, darker between the carinæ of face and clypeus, along the posterior margin of pronotum, over the medio-lateral areas of mesonotum, the abdomen and third tarsus. Tegmina hyaline, median vein and all the apical veins brown, on the median vein all the brown extends into the neighbouring membrane, a brown mark at the end of commissure; wings hyaline with brown veins.

Opening of pygofer oval, margin entire; anal segment small with two small spines on medio-ventral edge; armature arising from the middle of the diaphragma as a cultrate projection; genital styles large, flattened, curved, in lateral view bent at right angles before middle, apex pointed the apical portion curled round into nearly a complete circle, a small projection where the curl begins.

Length 2.5 mm.; tegmen 4 mm.

*Habitat.*—Demerara River, British Guiana.

**Megamelus timehri**, sp. nov. Fig. 9.

Male, macropterous. In structure and colour similar to the macropterous *M. notula* (Germ.) to which it is closely related. Spur slightly longer than first tarsal joint, thin and broad with apex rounded, numerous small teeth on the hind margin.

Dark brown, carinæ of head, legs, antennæ and pygofer lighter brown; tegmina hyaline, veins brown with a few minute granules bearing black hairs; wings hyaline with light veins.

Pygofer on the same plan as that of *M. notula* (Germ.), the ventral margin with three emarginations, a semicircular median one and a pair of lateral ones deeper than wide; anal segment small, closely embraced by the pygofer; genital styles small, flat, outer edge slightly convex, inner edge straight or slightly concave, apex obtusely pointed.

Length 2.2 mm.; tegmen 3 mm.

*Habitat.*—Demerara River, British Guiana.

*M. notula* (Germ.) differs from this species in having the two processes between the emarginations on the ventral edge of the pygofer much narrower and pointed, the genital styles are more pointed and have a large projection at base, and the anal segment is not closely embraced by the pygofer. The variety *flavus* (Crawford) differs from *M. timehri.*

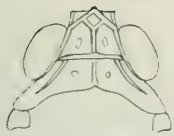

Fig. 6.—Dorsal view of head and pronotum of *Columbiana lloydi*.

Fig. 6a.—Face of same.

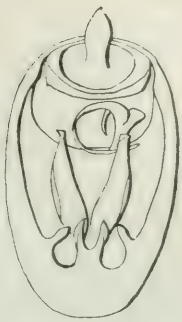

Fig. 7.—*C. lloydi*, full view of pygofer.

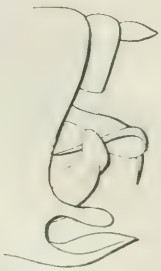

Fig. 7a.—Lateral view of same.

Fig. 8. — *Pissonotus megalostylus*, full view of pygofer.

Fig. 8a.—Lateral view of same.

Fig. 9. — *Megamelus timehri*, full view of pygofer.

Fig. 10. — *Chloriona fuscipennis*, full view of pygofer.

Fig. 11. — *Delphacodes guianensis*, full view of pygofer.

Fig. 12.—*Delphacodes subfusca*, full view of pygofer.

**Chloriona fuscipennis,** sp. nov. Fig. 10.

Male, macropterous. Length of vertex twice the width, apex slightly narrower than base, length of face two and one-half times the width, slightly wider on apical half; antennæ reaching to the base of clypeus or slightly beyond, first joint half the length of the second; hind tibia of equal length to tarsi, first tarsus longer than the other two together, spur nearly as long as first tarsus, wide, laminate, many small teeth on the hind margin; lateral pronotal carinæ diverging posteriorly, slightly curved, not reaching the hind margin.

Dark brown, front and middle legs lighter brown, antennæ, rostrum, hind legs, lateral portions of pronotum, middle of pro- and metanota yellowish or light brown. Tegmina hyaline, fuscous, an area over apex of costal and subcostal cells clear, infuscation darkest along cubital area, commissure white with a dark mark at apex, granules minute with black hairs; wings hyaline with brown veins.

Pygofer opening wide, dorsal emargination deep; anal segment sunk into emargination, round; genital styles long, straight, flat, narrowed on apical third, apex truncate.

Length 2.5 mm.; tegmen 3.4 mm.

*Habitat.*—Demerara River, British Guiana.

**Delphacodes guianensis,** sp. nov. Fig. 11.

Male, macropterous. Vertex as long as wide, length of face slightly more than twice the width, sides subparallel, slightly narrowed between the eyes; antennæ reaching slightly beyond the base of the clypeus, first joint more than half the length of the second (1 to 1.4); hind tibia longer than tarsi, first joint of hind tarsus as long as the other two together, spur large, as long as the first tarsal joint, broad, laminate, apex acute, small teeth on the hind margin.

Light brown or ochraceous; a minute black spot on the lateral carinæ of face in front of the ocelli, a slightly darker longitudinal mark down the tibiæ, abdomen darker with a light line down the middle of the ventral surface and on pleura. Tegmina hyaline, slightly yellow, veins yellow, granules fine with black hairs; wings hyaline with yellow veins.

Opening of pygofer slightly deeper than broad, anal segment small not closely embraced by pygofer, a pair of short, stout, curved, diverging spines on medio-ventral surface, their bases approximate; genital styles large, flat, broadest at apex which is truncate and oblique, outer edge slightly concave, inner edge produced into a process at the middle, which is longer than broad and rounded at apex.

Length 2 mm.; tegmen 3.3 mm.

*Habitat.*—Demerara River, British Guiana.

**Delphacodes subfusca,** sp. nov. Fig. 12.

Male, macropterous. Vertex slightly broader than long; antennæ reaching to base of clypeus, first joint about half the length of second; length of face about twice the width, slightly narrowed between the eyes, beyond which the sides are parallel; median carina furcate at base; hind tibia equal in length to the tarsi, first tarsal joint equal to the second and third together, spur as long as first tarsi at joint, wide, pointed, laminate, small teeth on the hind margin.

Light brown or ochraceous, darker between carinæ of head and over coxæ

and abdomen. Tegmina hyaline with light brown veins, granules very small bearing black hairs, a dark mark at end of commissure, wings hyaline with brown veins.

Opening of pygofer round, margin produced into a small lobe at each side of the anal segment; anal segment small with a pair of small, stout spines on the medio-ventral edge, touching at their bases and slightly diverging to the apices; armature or diaphragm small, Y-shape; genital styles long, flat, slightly curved, slightly narrowed at middle, apex truncate with the corners slightly produced.

Length 1.6 mm.; tegmen 2.0 mm.

Female lighter in colour, especially so on coxæ and abdomen.

Length 2.2 mm.; tegmen 2.8 mm.

*Habitat.*—Demerara River, British Guiana.

## SAMUEL WENDELL WILLISTON.

In the death of Samuel Wendell Williston, on August 30, 1918, American entomology has lost one of its keenest students. Although his professional work lay mainly in palæontology, in which field he attained great distinction, he also ranked as the foremost American dipterist of his time and a world-authority in this branch of entomology

The following brief sketch of his life is based upon, and largely quoted from, the admirable account by Prof. J. M. Aldrich, which appeared in the November number of the Entomological News (vol. XXIX, pp. 322-327, with portrait).

Samuel Wendell Williston was born on July 10, 1852, and was, therefore, 66 years old when he died. At this time and for some years previously he was Professor of Palæontology and Director of the Walker Museum in the University of Chicago. His boyhood was spent at Manhattan, Kansas, where he entered the Agricultural College, graduating in 1872. He began to study medicine in 1873, but in the following two years he spent the summer months in fossil-collecting expeditions in Western Kansas, the work being done for Prof. Marsh, of Yale University. After a winter at the Medical School of the University of Iowa, he visited Prof. Marsh in the spring of 1876, and this visit resulted in almost continuous employment with Marsh for nine years, until 1885, when he received his Ph. D., specializing in palæontology He also managed to finish his medical course in 1880, and in 1886 was appointed demonstrator in anatomy at Yale Medical School. So great was his ability as an anatomist that he obtained a full professorship in Human Anatomy in the following year.

After three years in this position he accepted a call to the University of Kansas as Professor of Historical Geology and Palæontology. Twelve years of arduous and productive work followed, during which he helped to organize the Medical Department of the University and took on the deanship of the latter in addition to his other duties.

Though possessed of a vigorous constitution, his health began to give way under the strain of overwork, so that, after resigning from this post, he went to Chicago in 1902 as Professor of Palæontology, in which capacity he was able to concentrate upon his chosen specialty. Here he spent the last 14 years of his

life, beginning under some unexpected hardships and gradually working up to full recognition and honours.

Williston never held an official entomological position, but he found time to do much valuable work as a pioneer in dipterology. His interest in flies began to be serious about 1878, but he was virtually alone in the field in America, and the difficulties which confronted him in the identification of genera and species were almost overwhelming. After a year or two of slow and tedious effort, however, he came upon Schiner's Fauna Austriaca, in which he found great relief and satisfaction, for he was now able, through its excellent analytical tables, to trace all his American flies to their families and, in most cases, to their genera. "He was so impressed by the saving of time accomplished that his own publications coming later show the effect of this early experience on every page; everywhere he has the beginner in mind and is clearing the way for him.

"In a few years he began publishing tenative papers analyzing the American families and genera of flies. These he extended and enlarged in a pamphlet in 1888, and again in a bound volume in 1896; and in 1898 published a third edition still more complete, with 1,000 figures, his well-known Manual of Diptera. This third edition is his main contribution to entomology. It is a handbook unapproached by anything else dealing with a large order of insects. From necessity he published it at his own expense; it was eight years before the receipts from sales covered the cost of printing, but happily he lived to see this consummation.

"His other papers of his early period, 1881-89, dealt with Asilidæ, Conopidæ, Tabanidæ, and smaller groups, and especially with Syrphidæ, in which his fine monograph of 1886 is still in universal use, and by the taxonomic genius of its author has created in the United States an ineradicable belief that the family is an easy one, well adapted for the beginner to publish in; a mistaken belief, but highly complimentary to the monographer.

"From 1890 his more important papers were concerned with tropical Diptera (Mexico, St. Vincent, Brazil), and with bibliography As his official duties grew more exacting, he gradually abandoned entomology, but he had as many farewell appearances as an opera singer, for he could not resist the temptation to come back again and again * * * But after 1896 he did little work on the order except in preparing the third edition of his Manual, which cost him two years of arduous work, as he drew 800 figures with his own hand His deep interest in genera and his very wide acquaintance with them, together with his universally recognized taxonomic ability, made him in the period 1890-1900, the peer of Osten Sacken, Brauer and Mik as a world-authority in Diptera."

Williston exercised a stimulating and inspiring influence upon his students, with whom he associated himself intimately. Although he never gave any formal entomological courses, he gave much informal assistance to many who were interested in his special studies, and among these are some of our most eminent dipterists, as well as others who attained distinction in palæontology. "But his life work was mainly directed to the larger circle outside his own institution."

"His last years were full of honours. He was a delegate to the International Zoological Congress at Monaco; Yale University gave him an honorary D. Sc.;

he was chosen to the limited membership of the National Academy of Sciences, and the Entomological Society of America made him an Honorary Fellow, one of seven out of its membership of 600.

"He was married in 1880 to Annie I. Hathaway, of New Haven, who survives him together with three daughters and a son."

In his concluding paragraph Prof. Aldrich says: "More than any other of my teachers, he became my ideal of a scientific man; and if in later years my ideal took on larger proportions, so he too seemed to expand in his nature powers; and at the close of his life I still feel that a splendid and inspiring example of scientific work and achievement is contained in his career."

## SOME NEW LACHNIDS OF THE GENUS LACHNIELLA.

(Homoptera-Hemiptera.)

BY H. F. WILSON, MADISON, WIS.

(Continued from page 22.)

**Lachniella nigra,** n. sp.

Descriptions made from specimens collected at Kilbourn, Wisconsin, August 18, 1917, on Pinus sp. Very abundant and found in colonies on the underside of the branches or on the trunk of young trees. General colour shining or a metallic chocolate brown, not pruinose. Colour notes from live specimens, other notes from alcoholic and balsam material. Types in the writer's collection.

*Apterous viviparous female.*— General colour metallic brown with the legs and antennæ black. After being in the balsam for a few months the antennæ and front and middle pair of legs became lighter, especially the tibiæ. Antennæ with the third segment being much stouter. Third segment approximately as long as the fourth, fifth and sixth together, the sixth being slightly longer than the fourth, and both less than the fifth. Third segment without sensoria, fourth with two small ones, and the fifth with one small sensoria near the middle, and a very large one at the distal end. Beak long, extending to the tip of the body. Nectaries very large and with a straight sloping base, cauda angled rather than rounded at the tip. Hairs abundant and of medium length.

*Measurements.*—Length of body 2.5 mm. Length of antennal segments: III, 0.5 mm.; IV, 0.187 mm.; V, 0.27 mm.; VI, 0.21 mm. Total length 1.34 mm. Length of beak 2 mm. Length of hind tibiæ 2.35 mm.

*Alate viviparous female.*—General colour bronze brown with antennæ and legs black. Colour notes made from live specimens, other notes from balsam mounts. After several months in balsam the antennæ and legs become lighter coloured. The antennæ from the base of the third segment, gradually becoming darker toward the tip, the last segment being dusky to black. The tibiæ of the first and second pair of legs excepting at the joints become quite clear, those of the hind pair continue to be dusky black. Third antennal segment approximately as long as the fourth, fifth and sixth. As in the apterous forms the antennæ taper somewhat, the last two segments being thicker than the preceding; from one to three sensoria are found on the distal end, except that occasionally two sensoria may occur near the end, and one larger one about the centre of the segment. Fourth segment normally with one sensorium, but two may occur.

Fifth segment with two large or one large and two small sensoria. Beak reaching to tip of abdomen, wings as usual in the genus. Nectaries not quite as large as in apterous forms, and cauda more rounded.

*Measurements.*—Length of body 2.25 mm. Length of antennal segments: III, 0.62 mm.; IV, 0.25 mm.; V, 0.27 mm.; VI, 0.187 mm. Total length 1.5 mm. Length of beak 2.15 mm. Length of hind tibiæ 2.6 mm.

**Lachniella montana,** new species.

Description made from three apterous specimens on one slide. Material sent to me by Prof. C. P. Gillette and designated as a new species by him under the name *Lachnus montanus* collected by Prof. Gillette at Cimmaron, Colorado, on oak August 22, 1906.

*Apterous viviparous female.*—General colour cannot be determined. Antennæ light coloured throughout, legs slightly darker without black areas. Antennæ reaching slightly beyond the hind coxæ, third segment not as long as the fourth, fifth and sixth together. Third and fourth antennal segments without sensoria, fifth with one at the distal end. Beak reaching slightly beyond the hind coxæ. Abdomen with a row of distinct tubercles along each side, which are raised areas on the front edge of each tracheal opening. A few scattered glandular areas are also to be found on the abdomen. Each hind tibiæ has a number of round to oblong sensoria on the upper side of the basal one-third of the segment. It is possible that the specimens at hand are oviparous females, but it hardly seems possible that this form would occur in that climate as early as August. The cauda and oval plate are slightly distinct.

*Measurements.* –Length of body 3.5 mm.; width 2 mm. Length of antennal segments: III, 0.72 mm.; IV, 0.31 mm.; V, 0.4 mm.; VI, 0.25 mm. Total length 1.67 mm. Beak: III, 0.23 mm.; IV, 0.21 mm.; V, 0.083 mm.

**Lachniella burrilli,** new species.

From material collected by Professor A. C. Burrill on *Sabina scopulorum* at Twin Falls, Idaho, July 6, 1917. One alate specimen in good condition, one apterous specimen in poor condition and a number of larvæ. Mr. Burrill states that these were found on the underside of the limbs feeding on the bark, and that they greatly resembled the colour of the bark. Mr. Burrill's notes on coloration are included in the descriptions. Specimens of what is evidently the same species but differing slightly were sent to me from Fort Collins, Colorado, by Professor C. P. Gillette. These were collected on the same food plant. Types in writer's collection.

*Apterous viviparous female.*—General colour closely resembles the bark, being black with pruinose patches which produce a calico effect. Antennæ cream-coloured at the base and black at the tip. Abdomen with two rows of black blotches along the median line and two rows of black dots dorso-laterally along the abdomen. Legs with the femora black, and the tibiæ black at the tip. Nectaries black, cauda light coloured. Antennæ with third segment less than length of fourth, fifth and sixth segments. Fourth longer than the sixth. Third segment with three sensoria, fourth with one and five with one. Nectaries small conical, and diameter of base not much greater than that of the opening. Body, legs and antennæ moderately hairy, hairs short and inconspicuous.

*Measurements.*—Length of body 3 mm. Length of antennal segments: III, 0.42 mm.; IV, 0.2 mm.; V, 0.17 mm.; VI, 0.12 mm. Total length 1.3 mm.

Beak: III, 0.166 mm.; IV, 0.166 mm.; V, 0.063 mm. Total length 1.56 mm.? Length of hind tibiæ 0.95 mm.; hind tarsus 0.21 mm.

*Alate viviparous female.*—General colour black with white pruinose areas producing a calico effect. Antennæ cream-coloured at the base of the third and fourth segments, other parts dusky and tip dusky black. Head dusky, thorax black, wings dusky, veins with dusky borders. Legs with femora light coloured at base and dusky toward the tip. Tibiæ light coloured except slightly at the base and a small part toward the tip. Tarsi black. Abdomen smoky, with two rows of dorso-lateral black dots, and an extra dot on segment four. Posterior segments almost black. Cauda black. Third antennal segment shorter than the three distal segments, four and five approximately equal, and six shorter than four. Beak reaching to base of nectaries. Nectaries cone-shaped and rather large. Cauda and anal plate broadly rounded.

*Measurements.*—Length of body 2 mm. Length of antennal segments: III, 0.33 mm.; IV, 0.166 mm.; V, 0.18 mm.; VI, 0.1 mm. Total length 1.36 mm. Beak: III, 0.166 mm.; IV, 0.166 mm.; V, 0.083 mm. Total length 1.55 mm. Length of hind tibiæ 1.46 mm. Hind tarsus 0.23 mm.

**Lachniella caudelli,** new species.

From specimens collected by A. N. Caudell at Kaslo, B.C., July 7, 1903, on spruce. One slide containing one alate and five apterous forms. This species is sufficiently distinct to warrant a description, although the material at hand is not abundant. Types in U. S. Bureau of Entomology collection.

*Apterous viviparous female.*—General colour cannot be determined. Antennæ light at the base growing darker toward the tip, last segment dusky. First and second pair of legs light except at the joints, tarsi dusky. Hind legs with femora light at base and dusky towards the distal end; tibiæ dusky except a light area near the base. Tarsi dusky and long and slender.

Antennæ with third segment shorter than the fourth, fifth and sixth together. Fourth and sixth approximately equal in length. Third antennal segment without sensoria, fourth with one small, one or none and the fifth with one large one near the distal end. Beak reaching to base of nectaries. Nectaries with base quite flat and about three times as wide as the opening. Opening proportionately larger than the base. Abdomen with two irregular rows of black spots dorsolaterally placed, and with two rows of five oblong spots which appear to be glands. These spots are distinct on two individuals but their structure is obscured by the balsam. Cauda broadly rounded and anal plate wide and dished.

*Measurements.*—Length of body 2.42 mm. Length of antennal segments: III, 0.63 mm.; IV, 0.166 mm.; V, 0.25 mm.; VI, 0.19 mm. Total length 1.28 mm. Length of beak: III, 0.23 mm.; IV, 0.18 mm.; V, 0.1 mm. Total length 1.76 mm.

*Alate viviparous female.*—Antennæ dusky throughout and each segment of the same relative thickness. Third segment slightly longer than the fourth and fifth together, the fourth and sixth approximately equal. Third segment with five or six large sensoria, fourth with one or two and fifth with one very large, and one small sensoria.

The legs are generally dusky black with a slight yellowish area near the base of the hind tibiæ. Wings with the median vein having but a single fork.

Whether or not this is normal cannot be told until more specimens are gathered. Only one nectary is visible but it is distinctly shown. The base is a little wider than in the apterous forms, and is distinctly cone-shaped but with widely sloping sides. Hairs on antennæ medium short and not overly abundant; they are shorter on the legs but more abundant. They are fine and inclined backward.

*Measurements.*—Abdomen of this individual crushed, approximate length 2.5 mm.? Length of antennal segments: III, 0.47 mm.; IV, 0.21 mm.; V, 0.27 mm.; VI, 0.22 mm. Total length 1.32 mm. Length of beak: III, 0.21 mm.; IV, 0.167 mm.; V, 0.083 mm. Total length 1.6 mm.

**Lachniella pinivora,** new species.

From material collected by A. D. Hopkins No. 7422.

Two slides containing six alate specimens. This species resembles *L. gracilis* quite closely but there is considerable difference between the two, in that the hairs at the base of the tibiæ of *L. pinivora* are longer and more inclined than is the case with *L. gracilis.*

*Alate viviparous female.*—Antennæ light coloured at the base of the third, fourth and fifth antennal segments, distal portion of these segments and the sixth dusky. First and second pairs of legs yellowish at the base of the femora and along the middle of the tibiæ. Other parts and tarsi deep dusky brown. Hind femora yellow at the base and dark brown at the joint, hind tibiæ with yellow area clear and covering about one-third of the segment. Nectaries large and volcano-shaped. Cauda and anal plate both broadly rounded. Third antennal segment with seven medium-sized sensoria widely set apart, fourth with one or two and fifth with two. Third segment shorter than the last three together, five distinctly longer than four and six four-fifths as long as four. Beak short, extending to the farther edge of the middle coxæ. Hairs long and drooping, but not so much so as in *L. strobi.*

*Measurements.*—Length of body 2.9 mm. Length of antennal segments: III, 0.55 mm.; IV, 0.22 mm.; V, 0.24 mm.; VI, 0.164 mm. Beak: III, 0.172 mm.; IV, 0.15 mm.; VI, 0.63 mm. Total length 1.25 mm. Length of hind tibia 2.29 mm. Hind tarsus 0.27 mm.

**Lachniella edulis,** new species.

From material collected by Mr. L. C. Bragg at Trinidad, Colorado, June 18, 1911, on *Pinus edulis.* Other specimens collected on the same plant by Professor C. P. Gillette at Walsenburg, Colorado, and by Mr. Bethel, Cannon City, Colorado, may possibly be the same species although some differences have been noticed. Types in writer's collection.

*Apterous viviparous female.*—Antennæ clear at the base and dusky at the tip. Two anterior pairs of legs dusky except over a greater portion of the tibiæ. Hind legs dusky except a light coloured area near the base of the tibiæ. Third antennal segment slightly shorter than the fourth and fifth together; sixth segment about two thirds the length of the fourth. Apterous forms on Prof. Gillette's slide do not show sensoria on the third segment, while those collected by Mr. Bragg have three small ones near the distal end. Fourth segment with one or two and fifth with two sensoria. Nectaries large and volcano-shaped. Antennæ and body with a moderate number of medium short hairs, legs more abundantly set with short drooping hairs. Hind tibiæ distinctly curved.

*Measurements.*—Length of body 3.74 mm. Length of antennal segments: VII, 0.5 mm.; IV, 0.25 mm.; V, 0.27 mm.; VI, 0.145 mm. Total length 1.32 mm. Beak: III, 0.187 mm.; IV, 0.155 mm.; V, 0.063 mm. Total length 2.1 mm. Length of hind tibiæ 2.9 mm.; hind tarsus 0.33 mm.

*Alate viviparous female.*—Specimens cleared before mounting and colour characteristics not definite. Antennæ with third, fourth and fifth segments light at the base and dusky at the tip. First and second pair of legs with femora dark, tibiæ light coloured except at the ends. Hind legs with the femora and tibiæ dark except a yellowish area near the base. Third antennal segment slightly shorter than the fourth and fifth together, sixth segment little more than half as long as the fourth. Third segment with four to six round irregular sized sensoria, four with two or three and five with two. Wings folded under the specimens so that venation cannot be determined. Nectaries very large and volcano-shaped. Tibiæ long and strongly curved. Antennæ and body moderately set with medium short hairs, hind tibiæ, thickly set with short drooping hairs.

*Measurements.*—Length of body 3.5 mm. Length of antennal segments: III, 0.52 mm.; IV, 0.31 mm.; V, 0.31 mm.; VI, 0.187 mm. Total length 1.55 mm. Beak: III, 0.25 mm.; IV, 0.21 mm.; V, 0.063 mm. Total length 2.8 mm. Length of hind tibiæ 2.8 mm.; hind tarsus 0.35 mm.

**Lachniella montanensis,** new species.

From material sent to me by Mr. J. R. Parker, of the Montana Agricultural College. Two slides, one containing specimens collected by F. C. Bishop at Florence, Montana, July 2, 1914, on Pine and a second containing specimens collected by Mr. Parker at Bozeman, Montana, June 25, 1915, on *Pinus laricis*. Types in writer's collection.

*Apterous viviparous female.*—Antennæ with segments three, four and five yellowish at the base and dusky at the tip, sixth segment completely dusky. Legs completely black except a small section at the base of the femora and light areas near the base of the tibiæ. This area is a little longer on the front tibiæ. Nectaries dusky black broken with light patches about the base.

Third antennal segment longer than segments four and five together, fourth almost equal to five and six about one-half as long as four. Third segment without sensoria, fourth with one or two and fifth with three. Nectaries large and volcano-shaped, cauda angular. Antennæ and body moderately hairy, legs, abundantly set with short and drooping hairs. Hind legs strongly curved.

*Measurements.*—Length of body 4 mm. Length of antennal segments: III, 0.58 mm.; IV, 0.27 mm.; V, 0.27 mm.; VI, 0.15 mm. Total length 1.46 mm. Rostrum: III, 0.31 mm.; IV, 0.31 mm.; V, 0.1 mm. Total length 2.39 mm. Length of hind tibiæ 2.9 mm. Length of hind tarsus 0.27 mm.

*Alate viviparous female.*—Antennæ dusky to deep black with light areas at the base of third and fourth segments. Legs as in the apterous forms except that the light areas on the tibiæ are less prominent. Nectaries similar to those of the apterous forms. Third antennal segment approximately equal in length to the fourth and fifth segments together. The two latter being approximately equal in length to the fourth and fifth segments together. The two latter being approximately equal in length. Sixth segment about one-half as

long as four. Third segment with seven or eight regular and round sensoria whose diameter is about one-half the diameter of the segment. Fourth segment with two or three and five with two sensoria. Beak extending slightly beyond the hind coxæ. Wings typical of the genus.

*Measurements.*—Length of body 4 mm. Length of antennal segments: III, 0.6 mm.; IV, 0.29 mm.; V, 0.29 mm.; VI, 0.15 mm. Total length 1.48 mm. Rostrum: III, 0.31 mm.; IV, 0.30 mm.; V, 0.1 mm. Total length 2.4 mm. Length of hind tibiæ 2.9 mm.; hind tarsus 0.39 mm.

**Lachniella schwarzii,** new species.

From material collected by E. A. Schwarz at Prescott, Arizona, June 20, 1901, on *Pinus* sp. Also three specimens collected by Professor C. P. Gillette at Laporte, Colorado, July 1, 1898, on *Pinus ponderosa*. Types in U. S. Bureau of Entomology collection.

At a first glance this species may be taken for *Lachniella montanensis* as the markings of the legs and antennæ are quite alike and the wings, nectaries and cauda are very similar. The antennæ vary considerably, and the beak of *L. schwarzii* is much the longer in proportion to the length of the body.

*Apterous viviparous female.*—Antennæ light coloured over basal two-thirds of third and basal one-third of fourth and fifth segments, remaining parts and sixth segment dusky black. The three pairs of legs except the base of the femora and a yellowish area towards the base of the tibiæ dusky black. This light coloured area is much more extensive on the two front pairs than on the rear pair.

Third antennal segment equal to or slightly longer than the fourth and fifth segments together. Fifth segment slightly longer than fourth, and sixth about two-thirds as long as four. Third segment with one small sensoria at the distal end, fourth and fifth with two each. These are larger than the one on the third segment. Beak long, extending almost to or beyond the tip of the abdomen. Hairs on antennæ and body moderately abundant. Legs thickly set with short drooping hairs. Hind tibiæ strongly curved. Nectaries large and volcano-shaped. Cauda angular.

*Measurements.*—Length of body 2.5 mm. Length of antennal segments: III, 0.56 mm.; IV, 0.23 mm.; V, 0.26 mm.; VI, 0.166 mm.; IV, 0.23 mm.; V, 0.1 mm. Total length 2.49 mm. Length of hind tibiæ 2.45 mm.; hind tarsus 0.33 mm.

*Alate viviparous female.*—Colour markings of antennæ and legs like those of the apterous female except that the light areas on the tibiæ are not as extensive. Comparative length of antennal segments as in the apterous form. Third antennal segment with four to six round sensoria of irregular size, fourth with one or two and fifth with two. Rostrum long, reaching to or beyond the tip of the abdomen. Cornicles large and volcano-shaped, cauda angular.

*Measurements.*—Length of body 3 mm. Length of antennal segments: III, 0.51 mm.; IV, 0.23 mm.; V, 0.25 mm.; VI, 0.166 mm. Total length 1.3 mm. Rostrum: III, 0.25 mm.; IV, 0.22 mm.; V, 0.1 mm. Total length 2.9 mm. Hind tibiæ 2.49 mm.; hind tarsus 0.31 mm.

**Lachniella pergandei,** new species.

Description made from four slides selected from 25 as being representative of the different stages of the species.

*Apterous viviparous female.*—Specimens in balsam collected by Theo. Pergande, from *Pinus inops* in Virginia near Washington, D.C., June 9, 1903. The prominent character of this species is the deep brown to almost jet black tibiæ set with heavy leaning spines.

Antennæ medium slender and extending to the second pair of coxæ. All segments light coloured at the base, dusky toward the tip. Sixth segment fingerlike and approximately as long as the fourth. Fifth segment with three small sensoria toward the distal end. Beak short, reaching to the base of the third pair of coxæ. Tip dusky black.

Nectaries conical and with a widely sloping base. Cauda bluntly angled and short. Abdomen covered with irregular black spots, a hair arising from each one. The purpose of these spots has not been determined; outside these are found other hairs or bristles, the entire body being set with numerous long spinelike hairs.

The femora are brown in colour and the spines, which are not as coarse as those on the tibiæ, stand more nearly upright. The tibial spines are set in a leaning position pointing toward the tarsi.

*Measurements.*—Length of body 4.16 mm. Antennal segments: III, 0.52 mm.; IV, 0.29 mm.; V, 0.31 mm.; VI, 0.25 mm. Total length 1.52 mm. Length of beak 1.5 mm. Hind tibiæ 2.39 mm.

*Alate viviparous female.*—Specimens in balsam collected by Theo. Pergande, on *Pinus inops*, Catholic University, D.C., June 19, 1905, and by H. F. Wilson at D. C. July 4, 1909. Three specimens in all. Antennæ dusky toward the tip, lighter at the base of the fourth segment and only the distal one-quarter of the third dusky. Legs with femora brown, tibiæ black. Beak black at the tip and extending slightly beyond the third pair of coxæ. Antennæel moderately slender and reaching to the hind coxæ. Segments four and five approximately equal. Fifth segment about three-fifths as long as the third, and much longer than the fourth or sixth. Third segment with six or eight round sensoria along the distal two-thirds. Fourth segment with two or three sensoria on the distal half. Nectaries as in apterous forms. Abdomen with numerous dusky spots each of which bears a spine-like hair as in the apterous form. Additional spines occur outside these areas. Entire body, legs and antennæ with numerous hairs.

*Measurements.*—Length of body 4.08 mm. Antennal segments: III, 0.56 mm.; IV, 0.27 mm.; V, 0.29 mm.; VI, 0.25 mm. Total length 1.55 mm. Length of hind tibiæ 2.33 mm.

(To be continued.)

## BOOK NOTICE.

THE WINGS OF INSECTS.—By J. H. Comstock, Ithaca, N.Y., The Comstock Publication Company. Pp. XVIII + 423, 9 plates and 427 figs.

Among recent publications in the realm of entomological science few have given us more pleasure to read than Professor Comstock's work on the wings of insects, a pleasure that arises not only from the intrinsic value of an important series of investigations thoroughly prosecuted, but also from the assurance that

the subject is presented to us in logical fashion by a recognized authority. The terminology of the wing-veins of insects has always been a subject for debate, and the difficulties have not been diminished by the fact that at different times various authors have adopted systems of nomenclature that have taken little recognition of the work of others. Some authors, indeed, have not helped to unravel the skein by using different systems even when dealing with the same order of insects. It is a matter for congratulation, therefore, that Professor Comstock has found it possible to gather together and present in book form his numerous researches and those of other workers with a view to the adoption of a uniform terminology, the well-known Comstock-Needham system.

Commencing with what he considers as the most likely hypothetical type of wing-venation, the author traces out the homologies of the wing-veins and shows how the more specialized forms have arisen from the more generalized along three quite distinct lines; namely, 1. Increase in the number of wing-veins by the addition of accessory veins. 2. Increase in the number of wing-veins by the addition of intercalary veins. 3. Reduction in the number of wing-veins by the coalescence of veins, and also in many cases, by the atrophy of veins. In support of his theories Professor Comstock brings to bear information and facts laboriously gathered from the various provinces of palæontology, morphology, embryology and histology. In the first of these, judicious use is made of the careful work of Anton Handlirsch embodied in his "Die Fossilen Insekten und die Phylogenie der Rezenten Formen." Whilst on the whole Professor Comstock agrees with the views of the palæontologist, he differs with Handlirsch in his idea that all insects had a common ancestry in the Palæodictyoptera of Devonian times.

In a work that bears throughout the impress of the master-hand, it were invidious to make distinctions; but we must say that the chapter dealing with "The Basal Connections of the Tracheæ of the Wings of Insects," written by one of Professor Comstock's students, appeals to us particularly as a very careful piece of work. It is shown that there is a strict correlation between the tracheation of the wings of insects and the venation, although this fact is often obscured in the adult to accord with its needs and habits. In the study of the tracheation of the wings of nymphs and of pupæ the truth of the conclusion is demonstrated that the wings of all orders of insects are modifications of a single primitive type, and that consequently it is possible to homologise the wing-veins of any of the orders with those of any other order.

In a series of nineteen chapters Professor Comstock discusses in detail numerous types of venation as found in the various orders of insects, and a valuable chapter outlining laboratory work in the study of the venation of the wings of insects, enhances the value of the book as an aid to the teaching of the subject in universities and colleges. The student will also find an exhaustive bibliography of the more important works referred to in the text. The illustrations are excellent, and the explanatory letters very distinct.

Entomological Branch, Dept. of Agri., Ottawa, Ont. A. E. Cameron.

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# POPULAR AND PRACTICAL ENTOMOLOGY.

## Dog Days.

BY FRANCIS J. A. MORRIS, PETERBOROUGH, ONT.

Almanacs heliacal and cosmic notwithstanding, sunworshippers in Canada during the first fortnight of July, 1916, could hardly question the ascendancy of Sirius. The heat was so intense here, in Central Ontario, that tropical thunderstorms burst over the land every few days without ever lowering the mercury longer than a matter of hours. For certain forms of insect activity (we may safely say) it cannot be too hot, and at such times, if your observer is a real enthusiast, he will be more than busy. For my part I was enjoying the rest and leisure of summer holidays by hurrying at red-hot speed—a slow walk sufficed—to a succession of stations at four diverse radial points from the city of Peterborough, six miles east to the Wood of Desire, eight miles south to the neighborhood of Hiawatha, two miles west beyond Jackson's Park, and five miles north between Nassau and Lakefield. At the western station I was burrowing into the heart of a woodpile with results that have already been put on record. I wish here to say something of a trip I took towards Hiawatha.

On July 5th I boarded the early morning train to Keene, my object being to make a general reconnaisance of the country lying between Indian and Otonabee Rivers just north of Rice Lake; a solitary tramp one April, when wild geese were wedging north, had revealed some likely looking woods, and their promise had been confirmed by a motor ride to Hiawatha and a river trip to Jubilee Point. I started out determined not to show any more bias or discrimination than a man who is "sot" in his few peculiar ways can help, and that was why I carried field glasses and a pocket plant-press as well as insect net and collecting bottle.

On leaving Keene station, after a few uncertain questings like a hound at fault, I finally headed west, nose to the ground, and swung south at the second cross-road, in full cry for a compact-looking bush of hardwood and hemlock. Presently I came to where dense cedar aisles flanked the road on both sides. Experience had taught me to look in such places for some of the smaller *Botrychiums* (ferns), and I dived into the depths. As soon as I had had time to collect myself and look about, like some Indian pearl-gatherer, I found myself staring at a large clump of Macrae's Coral-root (*Coralliorhiza striata*), still in bloom though 3 weeks later than usual; quite near it were some small plants of *Botrychium simplex*, while further on I found a few fairly large specimens of *Botrychium matricariæ (ramosum)*. All this on the west side of the road; on the east this rare Coral-root was abundant, especially some feet down a steep bank on the outskirts of the wood I had been making for. It seems to have a decided preference for sheltered roadsides and the edges of woods, especially under evergreens; though one station at least that I know of is under hardwoods. The plant, usually known as Striped Coralroot, is a western species, and in Ontario is reputed quite as rare as, say, the Evening Grosbeak among birds; in the neighborhood of Peterborough, however, it is of fairly general occurrence.

and I have found about a score of colonies; it is in fact "locally rare," but we happen here to be a favoured district for the plant, as we are for the bird.

Once down the bank I found the adjoining wood so inviting that I stepped in and spent a couple of the morning hours wandering about in the shadows of its cloistered beech and maple. A footpath traversed the wood N. E. to a clearing partly filled with woodpiles, and close by the path I happened on several colonies of *Corallorhiza multiflora* just coming into bloom, and yet another "sicht for sair een" in the shape of *Habenaria hookeri*. For this plant I had only known a single station heretofore, a few miles north of Port Hope, and in recent years the colony had dwindled to 1 or 2 plants in a season. Here by Hiawatha I counted close on a score of plants; it is nowhere nearly so common an orchid as its next-of-kin *Habenaria orbiculata*.

From the shadows I emerged about 11 a.m. into the glare of the clearing and made a fairly thorough scrutiny of the woodpiles; there were no traces of longicorns about them, but buprestids (mostly *Dicerca divaricata*) in great numbers and astonishingly active in the fierce heat; almost as ready to take to flight on being approached as to play dead, an unusual condition for the species; two kinds of *Agrilus*, also, were to be seen about the piles and numbers of *Chrysobothris femorata;* however, these insects had all become common to me and I was free to pass on to further explorations. I could not but admire, however, the wonderful protective colouring which enabled these large, heavily built *Dicercas* to shuffle about over the grey bark of beech or maple almost unobserved and immune from attack; on a single small woodpile I counted upwards of 40 of these insects basking, crawling, or settling on the billets, and I brought 11 home to mark the occasion. My parting thought was how lucky I should have thought myself a few years before, as a young collector, to meet so fair a fortune face to face right on the threshold of the woods and a July holiday.

Next I made my way to a small grove of pines on a knoll beyond a soggy pasture; here were some bushes of sweetbriar and a patch of gowans from whose blossoms I gathered a few *Lepturas*, *pubera* and *proxima*, *Clytanthus ruricola* and *Typocerus lugubris*—an old friend now met again for the first time since leaving Port Hope.

I then crossed to the S. W. of the meadow, approaching the road along the edge of a wooded swamp. Right in the sun stood a large hemlock, its bark glowing red in the light, and immediately in front of it were some logs of hemlock lying; on one of the logs I spied an uncommon *Dicerca* with somewhat short-pronged elytra tips, noticeably stout across the back and remarkably rugose, the ridges dark grey, but the grooves and channels brilliant with a mixture of silver and rich green as of verdegris. Hardly had I captured the prize when a facsimile suddenly lit on the standing hemlock; but alas! as I approached over the rough, swampy ground, the insect flew and soaring in an upward plane was soon swallowed in space. Have you ever fed your spleen at the expense of some poor lumbering spaniel trying by a sudden dash to surprise a flock of sparrows feeding by the barn—for ever foiled, but never losing hope? I have, and smiled cynically at its comic look of dejection; but when cynic and hound are both in one skin, look you, the cream is off the joke. My capture has been identified as *Dicerca tenebrosa*,one of the most pleasing to look

at of all its genus and quite rare,—this being only the third specimen ever taken by me.

Just south of where I made these captures ran a good gravel road east and west; I struck west and after two miles entered a wayside smithy for directions: here they told me that the next cross-road would take me south to Hiawatha and north to the flag station of Drummond's. Both here at the blacksmith's and further on at a farm where I called for a drink of water, I was conscious of being eyed with suspicious looks, but since August, 1914, I had been taken for so many aliens that I gave the matter hardly a moment's thought.

To my delight I recognized at the next corner a piece of country near the Otonabee through which I had once motored, and I knew there was a fine stretch of woodland just S. W. of the cross-roads. It is always a great relief to swing out of the dusty highway with its cramped fence margins into the spaciousness of pasture and woodland.

The wood was too dense at this point for floral treasures, and proved after all a very narrow belt with the river in full view just beyond some stumplands. Just north-west the axe had been recently at work levelling part of a farmer's woodlot; there were stacks of cordwood visible, and a recent storm had taken heavy toll of timber on the newly exposed western edge. In the mid distance I spied a fallen spruce and a large limb of beech torn from its trunk. The day was at its height and no tiniest breath of wind invaded the throbbing heat. If ever there were insects abroad here in the day-time, it would be now.

My first venture was the fallen spruce, but nothing was to be seen about its rough, scaly bark, or among the branches and foliage. In falling, however, it had struck and heavily "blazed" a nearby balsam fir; this tree was languishing, for the foliage had gone brown. On examining the tree closely, I found just beside the grazed patch of bark (which was oozing resin freely) a fine specimen—a large female—of *Xylotrechus undulatus* ovipositing, and then, somewhat lower, a male of the same species; these beetles I had seldom taken before, and had indeed been uncertain as to which of our conifers it attacked. But I was able to make good use of my discovery, and secured later in the season over a score of the insects in the Algonquin Park. The other tree infested by it is the hemlock, and very rarely I have captured a specimen on spruce. Both these beetles were on the sunny side of the tree, and when I worked round to the shady side no more of their kind were to be seen; but I soon detected—courting the shadow as usual—a pair of *Acanthocinus obsoletus;* this was of some interest, for I had never before taken the species on any tree but white pine, where it is fairly frequent. Examination of several other balsams brought no fresh captures and I determined to move on towards the S. W., where fire had run between the belt of woodland and the river.

A path took me right past the broken limb of beech, part of which lay along the ground. Beech had never before brought me any captures of longicorns, and I was passing on with only a casual glance when I was stopped short by a discovery that proved the forerunner of many interesting captures during the dog-days of 1916. It was a small specimen of *Neoclytus erythrocephalus* that I spied running along one of the branches of the fallen limb. I suppose this insect is fairly common, a few specimens were once sent me from near the Rideau by an old friend who had noticed them racing over some fresh-cut

logs and branches of maple; about 4 years ago I captured 3 or 4 on some newly-lopped branches of hawthorn. But they are quite a difficult insect to capture; in my experience they are even more active than *Neoclytus muricatulus*, a black species with white or grey pubescence, occurring on white pine. So far as I have been able to observe (by a comparison of these two species of *Neoclytus* with *Xylotrechus undulatus* and *colonus*), the former have a far better title to the name *Xylotrechus* than the latter, which are much more sedate and leisurely in their movements; both species of *Neoclytus* are expert and habitual "log-runners," as the word *Xylotrechus* implies; they have extremely long hind legs and travel at a great rate, zig-zag or spiral, even leaping or dropping from one branch to another, by long odds one of the nimblest of our longicorns; in hot sun, they are quite as active on the wing as in running and dodging. Indeed, they are seldom at rest, except momentarily when breeding, or while ovipositing in shadow on the under side of the limbs and branches. In about half an hour I had captured 3 specimens and lost 2 more; I found that they soon returned, after escape by dropping or flight, to the log or limb of their choice. Besides these, on the broken trunk and upper part of the torn limb I captured an *Agrilus* that was new to me, 5 or 6 specimens,—*Agrilus obsoletoguttatus*.

About a quarter of a mile farther on I came across an old hollowed beech, which the same storm had broken off near the root; the tree had been partly dead before its fall and appeared to be even more attractive than the sounder wood of the torn limb. I captured 5 *Neoclytus erythrocephalus*, including a breeding pair which I detected perfectly motionless on the under side of a small branch; several more *Agrilus obsoletoguttatus* and 2 *Agrilus bilineatus*. These were all captured from above or the sides, on the branches and limbs; before leaving I stooped to look at the under side of the trunk which was a couple of feet up from the ground and parallel with it. I immediately became aware of a grey longicorn—indeed a pair—and by lying down under the tree I was enabled to make captures at several points on the lower surface; 4 *Urographis fasciatus*, 1 *Hoplosia nubila* and 1 *Neoclytus colonus;* none of my readers, if interested in *Cerambycidæ*, will deny that this was reward enough for a certain discomfort of body; but, I have, sometimes, since, in atrabilious humour, pictured myself a middle-aged plumber of palpably inattenuate bulk, engaged in driving rivets up into the under side of many-jointed boilers and squat kitchen stoves.

On my way back to the road, I captured on raspberry foliage a specimen of *Oberea* having the thorax entirely light creamy brown, the body, legs, wings, and scutellum being black. This was the last of my captures that day, but the observations led eventually to quite a series of finds and really opened a fresh field of investigation for my tramps abroad.

The heat lasted on, and I managed a few days later to make a trip to the east section of the Wood of Desire, where beech trees are numerous; I figured on the storm which had taken toll so heavily near Hiawatha, having swept the west or windward side of that wood, and sure enough, I found nearly a dozen beeches down. On four of them, longicorns were busy; and on two that had come down together with roots intertwined, I captured 8 specimens of *Xylotrechus colonus* and 34 of *Urographis fasciatus*. Only trees in full sunshine seemed to be attractive, and the weather was unusually hot. I have examined beech assiduously all through July since 1916, and though I have made an

occasional capture, I have never taken insects in any great abundance. My experience has been very similar in the case of basswood, white pine, poplar, balsam and spruce; an occasional haul, but usually little or nothing; and even less on the harder wood of elm, maple, ash, butternut, hickory and oak. Theories are dangerous, but I incline to think that some sense of smell—probably sap or vegetable juices fermenting in the hot sun—releases the reproductive impulse in these woodborers and brings them in ever-growing numbers from all parts of a wood to the few windfalls that their instinct "senses" as the proper nursery of their race.

It was in piecing out such problems as these in the late afternoon of July 5th, 1916, in ruminating over the day's take, and in planning my next campaign, that I beguiled my way along the last few miles of this 12-hour jaunt. On arriving home I found that the weather man had recorded 98 degrees Fahr. in the shade, and when I caught sight of myself in the bathroom mirror I realized why I had been the object of so many suspicious looks. My face was tanned to the colour of a well-boiled lobster and smeared with muddy streaks that had once been summer dust; my tie had disappeared and my collar wilted to the form and semblance of a dirty handkerchief; the philosopher's dignity was further impaired by the revelation of a large, 3-cornered rent in one trouser leg. I was really lucky to have made my way home through more than a mile of populous city streets unarrested, if not unrecognized.

## NATIONAL COLLECTION OF INSECTS.

Dr. J. McDunnough has been appointed Assistant Entomologist, in the Entomological Branch, Department of Agriculture, Ottawa, to have charge of the National Collection of Insects. Canadian Entomologists will welcome the return of Dr. McDunnough to his native country, and his appointment to a position in which he will be able to devote his extensive knowledge of systematic entomology to the care and building up of the National Collection.

## AN ENTOMOLOGIST'S HANDBOOK.

An entomologist's handbook or compendium is very much needed, especially by economic entomologists. It is planned to compile such a handbook, which will include principles and methods of studying the life histories of insects, of conducting field experiments and demonstrations, handy tables for field workers, etc. It is desired to have references, or better, to have separates of all published notes dealing directly or indirectly with the subject and to have details, and if possible drawings or photographs as well, of cages, apparatus, methods, etc., as yet unpublished. The handbook will be a compilation and full credit given to all contributions.

The co-operation of entomologists is solicited.

JOHN J. DAVIS,
Box 95, West Lafayette, Indiana.

## THE CYRTID GENERA THYLLIS AND MEGALYBUS.

BY F. R. COLE, BUREAU OF ENTOMOLOGY, FOREST GROVE, ORE.

The genus *Thyllis* was established by Dr. Erichson in a monograph of the Cyrtidæ published in 1840. Four species were described in this paper, all from Capeland, South Africa. In the year 1865 Dr. Philippi described six species of Cyrtidæ from Chile, for which he erected the genus *Megalybus*. In 1868 Schiner gave notes on two Chilean species in his "Reise der Novara," recognizing in these two forms two of the species described by Philippi a few years before. In this paper Schiner placed *Megalybus* as a synonym of Thyllis. In a note he stated that there was no doubt in his mind that the genera were the same, at least no character was given that would justify separation. In the two species before him he noted that the eyes met above and below the antennæ and he continues, "whether this is the case with all *Megalybus* species I cannot say, were it so, those *Megalybus* species in which the eyes do not come together under the antennæ would be in another genus, that would then differ from *Philopota* in the wing venation, from *Thyllis* by the eyes not joining under the antennæ."

In 1876 Westwood described four species from Chile, stating "the names here employed for this genus and its four species were found attached to the specimens in Mss. when purchased, and have been retained, although, I believe, they have never been published." Evidently Westwood had not seen Philippi's above mentioned paper, for all four species were synonyms of those described by Philippi and had perhaps been named from his collection. Neither did Westwood compare the genus *Megalybus* with *Thyllis*, to which it is so nearly related. In his generic description he states that the eyes are contiguous above and below the antennæ.

It would appear then that Schiner was correct in his synonym, but unfortunately *all* of the Chilean species of this group do not have the eyes touching beneath the insertion of the antennæ. My attention was called to this point when examining specimens of what I take to be *Megalybus gracilis* Phil. in the U. S. National Museum. There are three specimens collected in Chile by Mr. E. C. Reed. All have the eyes distinctly separated below the antennæ. Mr. J. R. Malloch informs me that all of his Chilean species of the genus *Megalybus* have the eyes separated below the antennæ. Verrall, in his "British Diptera," considers *Megalybus* as a distinct genus. It may be that one sex has the eyes contiguous below the antennæ and the other has not; if so, it is something occurring nowhere else in the family. It is my opinion that the genera should be considered as distinct, although they are very closely allied, as can be seen from the figures. The species of *Thyllis* which I have figured has two median dorsal ridges on the mesothorax, which are not present in the Chilean species of *Megalybus*.

There are five genera in the Cyrtidæ belonging to the remarkable group Philopotinæ, if we consider *Megalybus* as a genus, the others being *Thyllis*, *Philopota*, *Terphis* and *Helle*. They are distinguished from all other Diptera by the remarkable development of the prothoracic humeral lobes, which meet in front of the thorax in these forms. Most of the species have a grotesque, hump-backed appearance.

Some of the literature on the two genera under discussion is rather inaccessible and I give a translation of the descriptions below.

## **Thyllis** Erichson.

"The proboscis has nearly the length of the body; it nearly but not quite reaches to the tip of the abdomen. The shield, lying at the base of the proboscis, projects somewhat in the form of a "Halbrinne." The antennæ are very small, the first joint exceedingly short, the second pear-shaped, the tip prolonged into a bristle. The pilose eyes are very large, contiguous in the middle line of the head, only that on the front arched side of the head there is a small triangular space for the face, a very small triangle on the vertex and also below the middle, island-like, a small rounded place, on the under side of which, but free from it, are placed the antennæ. On the somewhat raised vertex are three inconspicuous ocelli. Behind the eyes the head is considerably prolonged cylindrically. The head is moderately small. The thorax is convex, somewhat bowed or hunch-backed, the dorsal pieces of the prothorax are proportionately large, with the inner corners contiguous, and with the broadened anterior margin encroaching on the hind margin of the head. The separate segments of the abdomen are quite apparent. The wings have a complete submarginal cell, five incomplete posterior cells, of which the first takes in the tip of the wing, and two complete, long, slender discal cells. The body is thinly clothed with fine, short, recumbent, almost silk-like pile.

*Cyrtus*, under which genus (*Acrocera*) Fabricius and Wiedemann placed the one species described by them, is easily separated from these flies by the situation of the antennæ. It is more closely related, particularly in the structure of the thorax and the greatly developed prothorax, to *Philopota*. In venation it is intermediate between the two. In common with *Terphis* it has the eyes contiguous under the insertion of the antennæ."

The following is a translation of Erichson's descriptions of his four species.

### **Thyllis crassa.**

Black, red mottled, anterior margin of prothorax, curved lateral mesothoracic stripes and marginal fasciæ of abdomen yellow, costal region of wings fuscous. Length 2½–3½ lines.

*Acrocera crassa* Fab., Syst. Ent., 332,2.

*Cyrtus crassus* Wied., Ausser. Zweifl. Ins., II, 15,4.

Body black, finely cinereous pubescent. Prothorax rufous, anterior margin yellow, lobes on both sides with a median black spot. Mesothoracic dorsum on both sides with a lateral curved yellow stripe bordered rufous, above scutellum twin reddish spots, posterior calli before scutellum with median testaceous stripe; pleura with a reddish spot before insertion of wings. Scutellum with an apical rufous fascia. Abdomen swollen, each segment reddish apically, apical fascia attenuated on both sides, interrupted in the middle, yellow. Legs rufous, femora blackish, apex yellowish. Wings hyaline, costal vitta before apex marked fuscous. Squamæ hyaline.

Wiedemann described all the markings as yellow, Fabricius pointed out the presence of red at least on incisures of the abdomen.

### **Thyllis turgida.**

Black, marked reddish, outer and posterior margin of prothorax, and lateral mark on mesothorax yellow, wings fuscous hyaline, toward the costa fuscous. Length 4 lines.

Body finely ashy pubescent. Thorax black and red marked, prothorax rufous, anterior and posterior margin yellow, lateral subarcuate obsolete vitta on dorsum of mesothorax and posterior calli before scutellum yellow. Scutellum all red. Abdomen swollen, first segment black, narrow apical margin yellow, the rest rufous, base of 2-4 fuscous, apex of 4-6 with yellow margin. Legs reddish brown, unspotted. Wings fuscous hyaline, costal vitta wholly brown. Squamæ hyaline.

Near the foregoing species but somewhat larger; the prothorax also has the hind margin yellow, the yellow band on the side of the mesodorsum is simply bowed, on the wings the light part is brownish, and the brown colour on the veins reaches to the tip; the femora are entirely red, and without yellow tips.

### Thyllis obesa.

Black, anterior and posterior margin of prothorax, sides of mesothorax, scutellum and posterior part of abdominal segments yellowish, wings hyaline, fuscous toward costa. Length 4 lines.

Body finely ashy pubescent, black. Anterior and posterior margin of prothorax, dorsum of mesothorax on both sides with an arcuate marginal vitta and posterior calli before scutellum yellow. Scutellum black, yellow margined. Abdomen swollen, each segment above with terminal belt of yellow. Legs brown, femora from base to beyond middle black. Wings hyaline, costal strip fuscous, abbreviated before apex, rest of costa testaceous. Squamæ whitish hyaline.

In form similar to the two species above, somewhat more finely punctate and in colouring without a mixture of red, therein differing from *Th. crassa*, which also has the hind margin of the prothorax yellow and the lateral bands on dorsum of thorax are simply bowed. The yellow bands on abdomen are all of like size. The wings are coloured as in *Th. crassa*, the veins themselves are, however, not brown, as the bands lying back of them, but brownish yellow.

### Thyllis compressa.

Black, thorax compressed, on both sides with a longitudinal brown vitta and a posterior brown spot, abdomen oblong, ferruginous, segments with basal bilobed black spots. Length 3 lines.

Head black, frons a small spot, brown. Thorax gibbous, compressed, above on both sides with a longitudinal stripe, from anterior margin thence gradually attenuated to base of scutellum, almost straight, reddish at termination, before scutellum two small spots, oblong, marked yellow, posterior calli before scutellum yellow vittate. Scutellum thick, bordered rufous, with a median apical yellow spot. Abdomen as the thorax much less highly arched (than usual), oblong, parallel sided, apex rounded, convex above, brown, segments with two dorsal black spots confluent at base, a small intermediate spot of yellow included, the lateral margin and venter all yellow. Legs yellow, femora brown, base fuscous. Wings all fusco-hyaline. Squamæ whitish hyaline.

In the laterally compressed form widely differing from the foregoing species, at first glance appears nearer a *Philopota*.

All four species are from Cape Land. The third is in the Drege collection, the others are from the material sent by Krebs.

Below is the description of a species of *Thyllis* loaned by Prof. A. L. Melander which may prove to be an undescribed species when more material is collected. It is near *T. compressa* Erich.

**Thyllis,** sp. near **compressa** Erich.

Head rather flat in front. Eyes short blackish pilose and meeting above and below the antennæ (see Figs. 2b and 2c). It will be noticed that there is a line between the eyes below the antennæ. Antennæ brownish, the small first joint scarcely visible. Ocellar tubercle very small and with three ocelli. The occiput is black and punctate. Frons reduced to a tiny triangular shining black space. Proboscis does not quite reach tip of abdomen, black at base, brown the rest of the distance, lobes at tip of galea rather short.

Thorax black, marked with yellow and red, the pile rather short, fine and ashy coloured. There is a very noticeable ridge each side of the median line of the dorsum (see fig. 2a). The prothorax is very remarkably developed as in others of the group and is mostly pale yellow. It is butterfly-shaped as seen from above, marked with reddish brown on the lateral margins, and on either side of a median black spot. There is a yellow crescent rimmed with brown above the base of the wing and a smaller spot just back of it. Two oval yellow spots just in front of scutellum. Postalar calli pale mottled brownish, black in the depression just back of the wing. Scutellum black with yellow margin, the yellow expanded in the middle. Pleura black with a reddish brown spot on mesopleura. Halteres yellow.

Abdomen rather short and thick. First segment very short. Segments 2–5 increasing slightly in length, the incisures deep and clearly marked. Second segment broadest, the following gradually decreasing. Colour of abdomen mostly brownish red, all segments except sixth black basally. A median line of yellow spots on the posterior border of each segment, the yellow surrounded by a brownish red which nearly reaches the base of the segment. Lateral margin of abdomen narrowly whitish yellow as in the margin of the fifth segment. Venter yellowish. Squamæ whitish hyaline with a sparse fringe of short hairs. Very little of genitalia projecting in the female.

Coxæ and bases of femora blackish. Tibiæ, tarsi, tips and part of underside of femora yellow. Claws black, yellow at base. Venation typical of genus. Wing veins on anterior half of wing strong and blackish. Veins from posterior cells do not reach posterior margin of wing. Wing membrane strongly rippled, infuscated, darker in costal region. Length 5 mm, measured over dorsum of thorax 7mm.

One female specimen from Willowmore, Capetown, S. Africa, collected by Dr. Brauns. Specimen in collection of Prof. A. L. Melander.

Below is given a translation of Philippi's description of the genus *Megalybus* and its six species published at Vienna in 1865 in the K. K. Zool. bot. gesellsch. Verhandl., V, 15, p. 641–644.

The head is very strongly bowed (geneigt), rounded, composed almost entirely of the eyes, behind which a very prominent ring-like occiput is to be seen, that is, however, smaller than the front part of the head. The eyes are dark brown and pilose. The small ocellar triangle shows the usual three ocelli. In the middle of the height of the head when one sees it in profile, projects a small, smooth knob between the eyes, and under this are situated the small

apparently two-jointed antennæ, whose first two joints combined are hardly twice as long as this knob; the second (actually the third) is rounded and ends in a fine bristle. The proboscis is long, pointing back under the body, split at the end into two thread-like lips, which are somewhat curled up. The palpi are (as in *M. pictus*) very small, awl-shaped, horizontal. The thorax is as large as the abdomen, extraordinarily gibbous, that is, the mesothorax is raised high so that the abdomen forms a right angle with the forepart of the thorax; prothorax, mesothorax and metathorax are clearly separated by sutures.—The abdomen is cylindrical, thick or slender, six-segmented, but the first segment is very short; all segments separated by deep incisures.—The wing venation is nearest *Cyrtus*, but it is characteristic, namely the cell which takes in the tip of the wing is not petiolate as in *Cyrtus*. The squamæ are convex, thick, glass-like. The legs are simple; the tibiæ somewhat thickened at the end, entirely unarmed, the claws large, there are two "Haftlappen."

"The adult insect is found on flowers; the larvæ live, it would seem in wood, at least my son Karl, in Dec. 1863, found a fly of this genus just crawling out of a tree.

"1. *Megalybus pictus* Ph. M. niger, helvolo-pictus, antennis capitesque nigris, rostro helvolo; thorace vittis interruptis helvolis notato; abdomine crasso, maculis ternis triangularibus helvolis in quovis segmento picto; alis ante apicem fascia abbreviata nigra ornatis; femoribus nigris, genubus, tibiis tarsisque flavis. Length 3 lines, expanse of wings 5½ lines.

"Habitat in the province of Santiago.

"The prothorax is clearly differentiated, black, rimmed light yellow, has a short furrow in the middle, and its hind margin forms two corners. The mesothorax is of great height, has on the fore part four short, light yellow stripes, of which the side ones are strongly curved, and as many shorter stripes in the posterior part. The hind margin of the scutellum is yellow. On each side of the scutellum is a yellow dot between the edge of the mesothorax and the glass-like squamæ.

"2. *M. crassus* Ph. M. thorace maxime gibboso, rufo, strigis helvolis et castaneis picto; abdomine crasso, supra nigro-castaneo, et in medio marginis postici segmentorum macula parva triangulari flava notato, lateribus potius, ferrugineo, marginibus flavescentibus, alis hyalinis fusco-bimaculatis; pedibus e ferrugineo luteis. Length 3 1/3 lines, expanse of wings 8½ lines. (See figure).

"Captured in province of Valdivia.

"The head is brownish, the proboscis reaches three-fourths the length of the body. The antennæ are light brown and the prominence above them white. The prothorax is light rust brown with whitish yellow margins; the mesothorax is of the same ground colour and marked with the same whitish yellow stripes as *M. pictus*, but in the middle is deep chestnut-brown, and is highly arched in a very remarkable manner. The scutellum is dark chestnut brown, with whitish yellow margins. Also the abdomen is dark chestnut brown, with small triangular whitish yellow spots on the middle of the posterior margin of the second, third, fourth and fifth segments, on the sides rust brown with pale yellow margins. The wings have a blackish cross-band shortly before the tip, which reaches to the anterior margin, but ceases some distance from the posterior

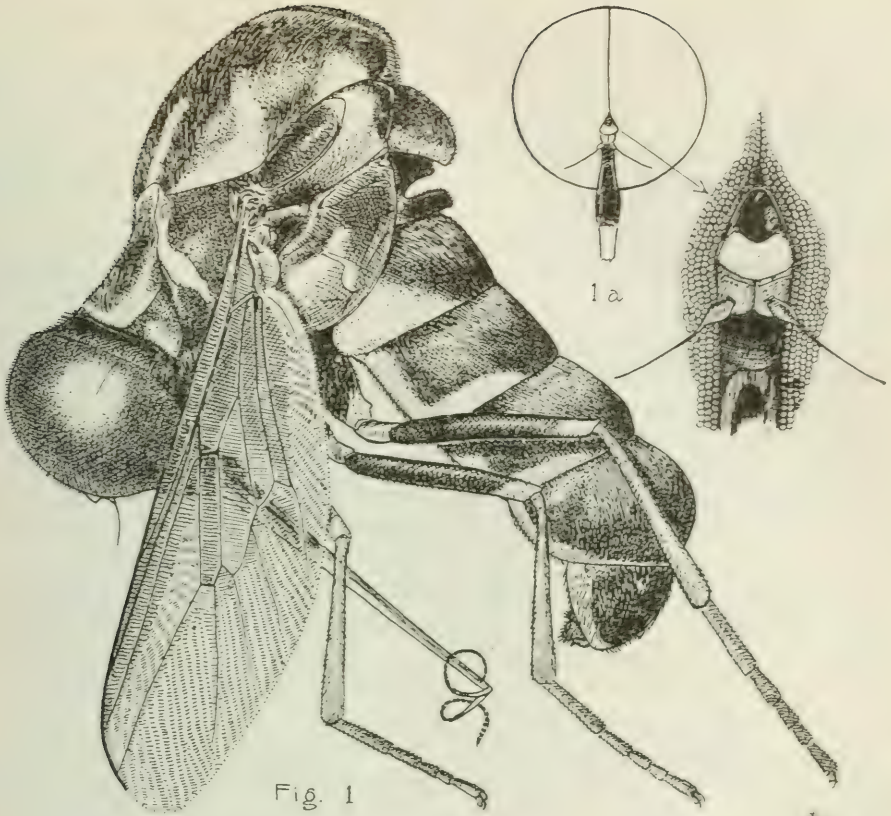


Fig. 1

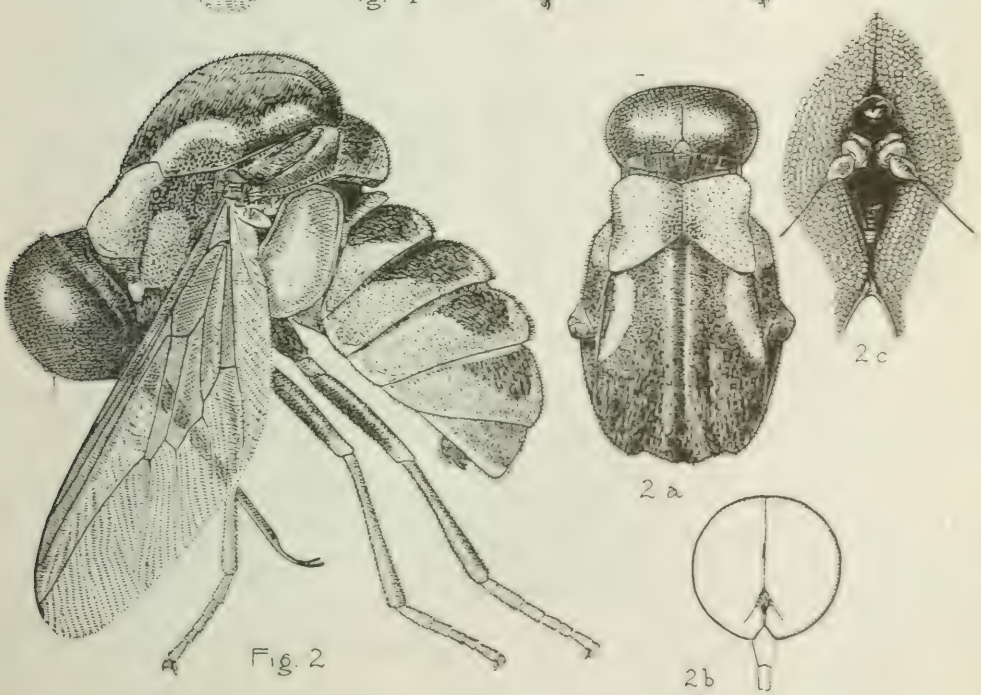


Fig. 2

THE CYRTID GENERA THYLLIS AND MEGALYBUS.

margin, and a blackish cloud in the middle. The legs are entirely yellow, and the femora hardly noticeably darker.

"3. *M. obesus* Ph. M. rufo-castaneus; antennisque nigris; thorace vittis tribus nigris, maculisque sex helvolis picto; abdomine crasso, ad medium marginum posticorum segmentorum macula parva helvola notato, ad latera immaculato; alis fusco-bimaculatis; pedibus rufo-fuscis, femoribus piceis. Length 3¼ lines, expanse of wings almost 9 lines.

"Specimen prope Corral æstate 186¾ lectum est.

"The proboscis is yellowish, the frontal prominence over the antennæ yellowish white. Of the spots on the thorax two are before the scutellum, another on either side before the base of the wing, and one on each side before the end of the scutellum. The fifth abdominal segment has a narrow yellow posterior margin, which coalesces with the yellow spot in the middle of the same. The abdomen is dull, the base of all the segments is clothed with fine reclinate hair, which gives the effect, that they shimmer gray in certain lights. This is the thickest and largest species and separated from *M. crassus* through the lack of yellow colour on the sides of the margins of the abdominal segments. By closer observation the whole colouring is seen to be quite different.

"4. *M. gracilis* Ph. M. corpore obscure brunneo; thorace quam maxime gibboso, flavo-picto; abdominis tenuis cylindrici, apici incrassati segmentis lateribus helvolo-marginatis; pedum luteorum femoribus supra fuscescentibus; alis infuscatis, immaculatis. Length 3½ lines, Expanse of wings 7 lines.

"Inhabiting the province of Valdivia.

"The dark brown eyes are white pilose, the antennæ brown, the frontal protuberance above the same whitish yellow, the light yellow proboscis is hardly half as long as the body. The thorax is brown, clothed with yellowish hair in front and ornamented with pale yellow marks. The prothorax has a yellow margin, the mesothorax is marked with four short yellow stripes above, with two short yellow stripes above the scutellum and a yellow stripe on each side, which commences back of the base of the wing. The scutellum is unmarked above, brown, but the underside is yellowish. The abdomen is very thin, cylindrical, thickened posteriorly; the second segment is as long as wide, smaller posteriorly, the third segment at least 1½ times as long as broad, the fourth similar, the fifth of the same length, but thickened posteriorly, the sixth segment is small, directed downward, not visible from above. The colour on the dorsum is dark brown, on the side each segment has a yellow spot, becoming broader posteriorly; the fourth and fifth have above in the middle of the posterior margin a small yellow spot, which on the fifth segment coalesces with the (also yellow) hind margin. The venter is yellowish. The wings are infuscated, brownish gray, unspotted.

"5. *M. tristis* Ph. M. corpore nigro, sub-unicolore; thorace minus gibboso, flavo-punctato; abdominis gracilis segmento primo lateribus, tertio in margine postico flavis; pedibus ferrugineis, femoribus atris, basi tibiarum nigricante; alis infuscatis, nubecula centrali obscuriore. Length of body 3½ lines, expanse of wings 6 lines.

"Taken in my Valdivian estate at San Juan, of which I have frequently spoken.

"The yellow proboscis is about half as long as the body or only a little

longer. The thorax is back and lacks the yellow stripes. Also the prothorax has no yellow margin, and only the raised edges, which separate the middle from the side parts of the same, have in their posterior region a yellow colouring. The Mesothorax is almost always very strongly arched but not so unusually as in *M. gracilis* or *M. crassus*. Over the base of the wing on either side is a small circular, yellow spot, and four of the same on the posterior margin before the scutellum, of which the outer are the larger. Also the downwardly directed tip of the scutellum is yellowish. The abdomen is of the same slender form as in the preceding species, but entirely black with the exception of the narrow posterior margin of the fifth segment, which is yellow; on the third and fourth segment only the lower half of the posterior margin is yellow, and on the second segment is likewise furnished with a yellow posterior margin. The legs are in general dark brown, the tibiæ lighter, the femora deep black, at the lower end with a yellow ring; also the ends of the tibiæ are yellowish. The wings are infuscated and have a dark cloud in the middle. At first glance one could take this species to be a colour variety of *M. gracilis*, but the height of the thorax is very different, etc.

"6. *M. subcylindricus* Ph. M. niger, margine prothoracis, vittis interruptis mesothoracis, margine posteriore lateribusque segmentorum abdominis cylindrici, crassiusculi flavis; alis infumatis; pedibus luteo-ferrugineis, femoribus nigris. Length of body 2¾ lines, expanse of wings 4½ lines.

"One specimen taken with the previous species.

"The head is black, frontal protuberance and proboscis yellow. The prothorax has a yellow hind margin and now and then the anterior margin is yellowish brown. The mesothorax is highly arched for this genus, somewhat as in *M. tristis*, and has in front four abbreviated yellow stripes and four similar stripes posteriorly. The margin of the scutellum and the sides of the mesothorax are yellow. The abdomen is not nearly so slender as in *M. gracilis* and *tristis*, but much thinner than in *M. pictus* and *crassus;* the first segment is clearly visible, the second broader than the following, but the same length as these, the third, fourth and fifth are apparently as broad as long. The sides and posterior margins of these segments yellow and the margins have a yellow spot in the form of a triangle in the median section of the dorsum. The wings are infuscated, unspotted, yet a darker cloud can be made out in the middle. The legs are dark as in *M. tristis*.

Through the kindness of Mr. F. Knab I obtained the loan of three specimens of a species of *Megalybus* from Chile which I have mentioned in the first part of this paper. They are probably *M. gracilis* Phil. and I give a description below:

Head black, occiput ring-like and with a rim next to the prothorax (see fig. 1). The occiput is finely punctate and with fine white pile. Eyes with fine, short white pile, the facets very small. Ocellar tubercle triangular and raised only slightly. The head appears round from in front and more than a hemisphere viewed in profile. The small triangular frons projects somewhat and is black at the base, the lower half being ivory white. The antennæ are small, yellowish brown, contiguous at the base, the first joint scarcely visible, the third ending in the usual bristle. The eyes are separated below the antennæ by almost the width of the frons at the widest part (see fig. 1a). The proboscis reaches almost to the tip of the abdomen, brownish at the base, otherwise yellowish, and ends

in two long slender lobes which are curled up and give the appearance of being jointed beyond the middle. (See fig. 1).

Prothorax remarkably developed as in others of the group, dull black, finely punctate, and with yellow margins. The thorax is of like colour and texture, short shining white pilose posteriorly and laterally, the rest brownish pilose. Two widely separated, short yellow lines on the anterior mesonotum, and a yellow curved mark outside these on the lateral margin. Two oval yellow spots in front of the scutellum, and a yellow spot above the postalar callosities which runs down across them. Scutellum black with a yellow hind margin. Pleuræ black with a yellow mark in front of the wing.

Abdomen black, the lateral margins yellow, broadly on the second, the yellow reaching across on posterior margins of segments some distance. First segment very short. On the dorsal margin of the second, third and fourth are small median yellow triangles. The sixth segment is black with a yellow margin. Squamæ with narrow margin and almost transparent membrane. The pile on the abdomen is rather short, recumbent and shining in certain lights.

Legs yellow, femora blackish brown, pale beneath, the base and tips yellow. Tibiæ and tarsi yellowish brown. Wing venation typical, the membrane strongly rippled and infuscated light brown.

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### Explanation of Plate II.

Fig. 1. *Megalybus gracilis* Ph.
- 1a. Outline drawing of head from front and greatly enlarged figure of frons and the region around it.

Fig. 2. *Thyllis compressa?* Erich.
- 2a. Head and thorax from above.
- 2b. Outline of head fron front.
- 2c. Drawing showing eyes meeting above and below the insertion of the antennæ.

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## AN APPEAL FROM BELGIUM.

The following letter has been received from the Curator of the Entomological Section of the Royal Museum of Natural History of Belgium:

Translation.

Brussels, 11–1–1919.

Dear Sir:

It is absolutely necessary that you write some notices in the American scientific journals in order to save the Selys Catalogue. I have lost twenty subscriptions in Europe and I must retrieve them in the United States. Financial aid from the de Selys family is impossible for a long time. Each new subscription will bring a little capital to the reconstitution of this work which can be brought to a termination with a little energy and with the aid of all. The great institutions, libraries, etc., ought to put some of their pennies into subscriptions. . . . .

Here we have suffered much from the slow and inexorable hunger, from the nervous depression of our abominable slavery that no one can describe. Our museum and our collections are saved, but I have lost one of my two sons who was at the front, a fine boy of 24 years, a captain of engineers. I have lost a part of my small fortune and my health, but more I fear that the sufferings from hunger have compromised the future of my younger son and of my grandchildren.

The balance sheet is sad, and I have little courage to take it up. I would not, however, see the Catalogue, to which I have devoted myself for years, founder. This is why I call for your aid. Write to your entomological friends and sustain me,

Yours sorrowfully,

G. Severin.

The Baron Edmond de Selys Longchamps (1813-1900) was known as the chief authority on the taxonomy and geographical distribution of the Odonata. He formed an extensive collection of these insects and of other "neuropteroids" from all parts of the world, and of the vertebrates and some other groups of Europe. These collections were presented, after his death, to the Brussels Museum by his two sons.

The publication of the *Catalogue Systematique et Descriptif des Collections Zoologiques du Baron Edm. de Selys Longchamps*, "designed to realize the supreme desire of their late possessor and at the same time to serve science," was begun in 1906 under the care of the two sons, M. Severin and a number of zoologists, who interlook, as specialists, the preparation of certain parts thereof.

It was planned to appear in 32 fascicules of a varying number of pages, of large quarto size, illustrated by text figures and some plates. The subscription price for the complete work was fixed at 25 centimes (20 centimes for the fascicules on Orthoptera, Lepidoptera and Vertebrata) per page of text, 2.75 francs per coloured plate and 2 francs per black and white plate, with an increase of 25 per cent. for subscriptions to separate parts only.

At the beginning of the war 21 fascicules had appeared, treating of the Orthoptera, Embiidae, Perlodides, Megaloptera, Trichoptera, Asculaphidae, Libellulinae, Cordulinae, Aeschninae, Birds, Mammals, Amphibia and Fishes, at a total price of 703.50 francs. The eight fascicules on the Libellulinae by Dr. F. Ris, of Rheinau, Switzerland, constitute the most extensive monograph on that subfamily ever produced, and several other groups have been dealt with a similar fashion. Several fascicules are in such an advanced state of preparation or of printing that they can be issued in a short time.

There are many reasons—scientific, humanitarian, international, appreciative of the nation which has suffered so fearfully—why the Selysian catalogue should be carried to completion, and it is to be hoped that readers of this appeal will personally do all in their power to aid in this accomplishment by inducing institutions which they can influence to subscribe. All correspondence relating to subscriptions should be addressed to M. G. Severin, Musee Royal d'Histoire Naturelle, 31 Rue Vautier, Bruxelles, Belgium.

Philip P. Calvert,
University of Pennsylvania.

## THE DIPTEROUS GENUS IMITOMYIA TNS. (HIMANTOSTOMA LW.).

BY J. M. ALDRICH, U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF ENTOMOLOGY.

Loew described *Himantostoma sugens* as number 87 of his Fourth Century of N. A. Diptera, in Berliner Ent. Zeitschrift for 1863. He appended a note describing the genus as new also; it contained but the one species, based on a single male specimen, the locality being given as Illinois.

Until recent years this genus remained an enigma to dipterists. Coquillett in his Revision of N. A. Tachinidæ, 1897, 40, mentions it among those unknown to him. Adams, in Williston's Manual, 1908, 377, lists it among those which he cannot place in his table. Townsend, however, states in his Taxonomy of the Muscoidean Flies, 1908, 126, that he has seen the type; without further comment he places it in his tribe Clistomorphini, family Phasiidæ. Later (Proc. Ent. Soc. Wash., XIV, 49, 1912) he proposes Imitomyia to replace Himantostoma, which is preoccupied by Agassiz in Coelenterata in 1862; this time he refers the genus without comment to tribe Eutherini, subfamily Pseudodexiinæ, family Exoristidæ.

In 1915 Harrison E. Smith published the new genus and species, *Saskatchewania canadensis* (Can. Ent., XLVII, 153), based on two males and four females taken at Farwell Creek, Saskatchewan. A few months later when visiting me he stated that Dr. Townsend believed this to be the long-lost *Himantostoma sugens*.

On June 18, 1918, I collected thirteen females of *sugens* at Minot, N.D., on flowers of ox-eye daisy growing in low ground (slough or hay land among small timber) near the Mouse River just above the city. One of these I later sent to Nathan Banks at the Museum of Comparative Zoology, who compared it with the type of *sugens* and pronounced it the same species. My material exactly fits Mr. Smith's excellent description of *Saskatchewania canadensis*, and was taken about 60 miles from the southeast corner of Saskatchewan.

Since the species has been rediscovered in the northern plains region, it would appear quite likely that the original specimen came from there also. Osten Sacken received much material from Robert Kennicott (see his Record of My Life Work, p. 35), who collected in Illinois as well as in the far north for him; so there was an opportunity for error before the specimens reached Osten Sacken.

In 1897 Thalhammar (Termesz. Füzetek, XX, 145) described a *Himantostoma hungarica* from Hungary. Bezzi in the Palæarctic Catalogue made this a synonym of *Ancistrophora mikii* Schiner.

The genus was described by Professor Bezzi in Boll. de Lab. Zool. Portici, XII, 86-93, 1917. Here he recognizes *hungarica* as a valid species of *Himantostoma*, and describes a species from North Africa as *H. mochii*. In receiving this paper from the author in 1918, I sent him a specimen of the type species *sugens*, and he has since informed me that neither of the old-world species is congeneric; *hungarica* he puts back as it was in his catalogue, and has proposed a new genus for *mochii*, which is still I believe unpublished.

A new description of the genus and species is unnecessary, since Mr. Smith has given a complete one which is readily accessible. I will add, however, that in the table in Coquillett's revision Imitomyia will come out at couplet 6, page 30, where it separates by possessing a long, slender proboscis and very striking flat facial carina; and in Adams's table it runs to couplet 10, p. 361, where it separates on the same characters.

March, 1919

# SOME NEW OR SCARCE COLEOPTERA FROM WESTERN AND SOUTHERN FLORIDA.—III.

BY W. S. BLATCHLEY, INDIANAPOLIS, IND.

(Continued from p. 32.)

**Molorchus semiustus** Newm.—One specimen taken by beating in Skinners' Hammock, March 9. Usually classed as a variety of *bimaculatus* Say, but aside from the nearly uniform reddish-brown hue, it is stouter, with broader more depressed thorax, the sides of which are less rounded and disk without the smooth callosities present in *bimaculatus*. It has previously been known only from St. John's Bluff and Crescent City, Fla.

**Neoclytus erythrocephalus** Fabr.—One specimen taken at same place as the two preceding, Feb. 16. Schwarz (Ms.) notes its occurrence at Enterprize and Crescent City.

**Leptostylus parvus** Lec.—One taken at light in house at Lakeland, Feb' 22. Schwarz (Ms.) records it from Lake Worth and Key West.

**Labidomera clivicollis** Kirby.—I was surprised to find this large, well-known Chrysomelid not listed from Florida. Two specimens were beaten from bunches of dead leaves, where they were hibernating, in February at Skinner's Hammock.

**Galerucella nymphææ** Linn.—This is usually supposed to be a species of strictly northern distribution. Five specimens were obtained from the flowers of the yellow water-lily, *Nymphæa advena* Sol., near Moore Haven, Fla., on March 2. It is possible that the species may have been introduced near there from Northern Europe, where it is said to be common.

**Disonycha leptolineata** Blatch.—Farther examination of 30 or more specimens taken during the past two winters leads me to believe this distinct and not a variety of *D. abbreviata* as described.* It occurs on ferns in Skinner's Hammock in February and March, and has also been found at Lakeland and Lake Istokpoga.

**Longitarsus fuscicornis,** sp. nov.—Oblong-oval. Shorter and more convex than *L. testaceus* Lec. Pale brownish yellow, not alutaceous, head and hind femora slightly darker; elytra with a vague darker, W-shaped, scutellar blotch; antennæ fuscous, the four basal joints pale; under surface dusky brown. Antennæ rather stout, two-thirds as long as body, the second, third and fourth joints subequal in length, shorter than those which follow. Thorax slightly wider than long, sides feebly curved, rounded into base, disk very minutely and sparsely punctate. Elytra one-third wider at base than thorax, rather strongly convex, umbones evident but small, punctures of disk very fine, almost invisible. Wings present. Length 1.3–1.5 mm.

Described from four specimens swept from low vegetation about ponds near Dunedin, Oct. 26–Dec. 13. Differs from both *testaceus* and *cotula*, our other species of similar hue, by the fuscous antennæ and the lack of the greasy aspect which they have, due to their alutaceous surface. The form is comparatively more robust than in either, and the punctuation finer.

**Longitarsis solidaginis** Horn.—Two specimens taken by sweeping north of Dunedin, March 20 and 25. Known only from Sumter and Orange Counties, Florida.

*Can. Ent., 1917, 143.

**Chætocnema cribrifrons** Lec.—Taken at Dunedin by sweeping in February. Horn gives its distribution as Colorado, Texas, Dakota, Georgia and California.* This is the first record for Florida.

**Epitrix parvula** Fab.—Horn says of this species: "Occurs throughout the entire U. S. extending also to the West India Islands." It has not been reported from Florida. A specimen was taken by sweeping on Hog Island, March 26.

**Bruchus coryphæ** Oliv.—One specimen beaten from a mass of Spanish moss near Dunedin, Dec. 23. No previous published record for the State. Schwarz (Ms.) notes its occurrence at St. Augustine and Haw Creek.

**Bruchus cruentatus** Horn.—Hibernates like the preceding in bunches of Spanish moss. Quite frequent near margins of lakes at Lakeland, Feb. 22, and also taken at Dunedin on several occasions, Nov. to March. Recorded only from Tampa. The hind legs of Florida specimens are more often red than black. The form with red spots absent, *nigrinus* Horn, also occurs near Dunedin, but only two specimens have been found.

**Bruchus macrocerus** Horn.—This species, known heretofore only from New Jersey, Tennessee and District of Columbia, occurs also near Dunedin, three specimens having been taken in March while sweeping huckleberry and other low shrubs.

**Bruchus compressicornis** Schæff.—Frequent at Dunedin; also taken at Ormond and Sanford. Occurs on flowers of the frost-weed, *Helianthemum corymbosum* Michx., in March and April. Described from Brownsville, Texas, and not elsewhere recorded.

**Strongylium anthrax** Sz.—Described from Enterprise, and noted by Schwarz (Ms.) as occurring at St. Augustine. One specimen taken at porch light at Dunedin, Aug. 6.

* * *

The family Cistelidæ is especially well represented in western Florida. Five species from there have been described by the writer in previous papers, and at least half a dozen which cannot be placed by the literature extant are at hand. Examples of all species taken were recently sent to Col. Casey, who monographed the family some years ago.** He states that a number of them are unknown to him. Notes on several of the species and descriptions of three which are undoubtedly new are herewith given as follows:

**Hymenorus difficilis** Casey.—Two specimens, so pronounced by Casey, are from Ormond and Dunedin. They were taken in April by beating. His type was from New York.

**Hymenorus dichrous,** sp. nov.—Elongate-oval, large for the genus. Nearly uniform dark brown, shining; head and thorax often slightly darker; elytra with basal third more or less tinged with dull red; antennæ, palpi and legs pale reddish brown. Head small, coarsely and sparsely punctate between the eyes which are very large, coarsely faceted, separated by about their own width (female), almost contiguous (male); clypeus, and occiput behind the constriction, coarsely and densely punctate. Antennæ short, stout, the apex of eighth joint reaching base of thorax, the third and following joints subequal in length, the second only one-fourth the length of third. Thorax one-third wider than

*Trans. Amer. Ent. Soc., XVI, 1889, 261.
**Ann. N. Y. Acad. Sci. VI, 1891, 69–170.

long, sides straight from base to beyond middle, thence rounded into apex, hind angles rectangular; disk rather closely, not coarsely aciculately punctate, the punctures separated by nearly their own diameters. Elytra scarcely wider at base than thorax, sides parallel for two-thirds their length, then converging and rounding to the obtuse apex; striæ very fine, their punctures small, round, close-set; intervals flat, each with two rows of minute punctures, each puncture bearing a rather long, strongly inclined, pale brown hair. Abdominal segments 1–3 finely and sparsely punctate, four and five almost smooth.

Length 6.7–7.2 mm.

Described from nine specimens taken at Sanford and Dunedin, Fla., March 29–Oct. 31, mostly by beating, some at porch light. In colour resembles *dorsalis* Sz., but larger, broader, less parallel, with shorter antennæ and more sparsely punctate thorax, the red hue of elytra less distinct. In *dorsalis* the eyes are as widely separated in male as in female, the back portion of occiput is sparsely punctate, the middle of seventh joint of antennæ reaches base of thorax, and the punctures of elytral intervals are much more distinct than in *dichrous*.

**Hymenorus sabalensis,** sp. nov.—Elongate-oblong, smaller and more slender than *dichrous*. Head, thorax, antennæ and basal third of elytra dull red, legs paler; apical two-thirds of elytra dark brown. Head rather large; interocular area and clypeus coarsely and very sparsely punctate; eyes separated by one-half their width. Antennæ rather stout, half the length of body, the third joint two-thirds the length of fourth. Thorax one-half wider than long; sides evenly and broadly curved from basal third to apex; disk vaguely and broadly impressed each side on basal third, its surface sparsely and rather finely punctate, the punctures separated by twice or more their own diameters. Elytra at base slightly wider than thorax; striæ fine, their punctures small, close-set; intervals slightly convex, each with two rows of punctures which are almost as large as those of striæ. Under surface dull red, the abdomen punctate as in *dichrous*, the prosternum more densely so. Length 6 mm.

One specimen taken by beating palmetto leaves on Hog Island, March 22. Distinct by its peculiar coloration and widely spaced punctures of thorax.

**Hymenorus sobrinus** Casey.—One specimen, so determined by Casey, taken at Lakeland, Feb. 22, by beating masses of Spanish moss. The species was described from Florida without definite locality.

**Andrimus brunneus** Casey.—Frequent at Dunedin and La Belle in February and March. Taken by sweeping, and, in late March, at porch-light. Described from Haulover, Florida.

**Andrimus parvulus,** sp. nov.—Elongate-oblong. Pale chestnut-brown, shining; legs and palpi paler. Head small, with a wide groove between the eyes; clypeus and occiput finely and densely punctate. Eyes large, coarsely granulate, separated by a distance one-third greater than their width. Antennæ stout, joints 4–11 flattened, 2 and 3 together only one-third the length of fourth. Thorax subquadrate, slightly wider than long, base squarely truncate, front and hind angles rounded; disk minutely alutaceous, very finely and sparsely punctate, without trace of basal foveæ. Elytra one-third wider at base than thorax, sides subparallel to apical fourth, then feebly converging to the separately rounded tips; striæ fine, their punctures small, close-set; intervals flat, each

with a single row of minute, hair-bearing punctures. Under surface very finely and sparsely punctate. Length 5.5 mm.

Dunedin, March 29, 31; swept from huckleberry. Smaller and paler than our other species, the antennal joints relatively broader, the second and third shorter than in any of the others.

**Toxotropis floridanus** Leng.—This prettily marked little Anthribid occurs on ferns in dense hammocks, a half dozen or more having been taken near Dunedin, January–March. It was described from Enterprise, Fla., and is not known outside the State.

**Rhinomacer pilosus** Lec. — Although it is said that the species of *Rhinomacer* occur exclusively on coniferous trees, a dozen or more specimens of *R. pilosus* were swept from an Ericad, *Xolisma fruticosa* Michx., near Dunedin, in January. The plant was then full of the fruit or seed pods of the season before, and the weevil was doubtless living in or among these.

**Tachygonus lecontei** Gyll.—This species is not mentioned in any of the lists of Florida Coleoptera. It has been taken by the writer at Jacksonville, Ormond, Lakeland and Dunedin, a half dozen or more having been secured the past winter by beating oak about the borders of ponds or hammocks.

**Listronotus floridensis** Blatch.—This well-marked weevil was found in numbers near Moore Haven, March 2, on the flowers of an arrow-head (*Sagittaria*). Fresh specimens are more conspicuously and densely scaly than any of the allied species.

**Otidocephalus dichrous** Sz.—Occurs at light; three specimens taken in June at porch-light, having been sent me from Dunedin.

**Anthonomus costulatus** Suff.—This is a submaritime species frequenting the foliage of the Florida buttonwood, *Conocarpus erecta* L. It was taken in numbers on Hog Island in February and March.

**Anthonomus sexguttatus** Dietz.—Both this species and *Neomastix solidaginis* Dietz occur frequently about Dunedin on the flowers and foliage of a tall scurfy Ericad shrub, *Xolisma ferruginea* Walt., which grows in very dry sandy soil. The *Neomastix* was also taken at Lakeland and Ft. Myers.

**Baris scintillans** Casey.—This, the smallest and one of the most shining members of a large genus, was taken at Lakeland and Moore Haven in some numbers by sweeping low vegetation about the borders of lakes. It is probably wide spread throughout southern Florida.

**Nicentrus grossulus** Casey.*—This name should replace that of *Nicentrus canus* Lec., on page 392 of the "Rhynchophora of N. E. America," and *Limnobaris canus* Lec. should be inserted near the top of page 402 of that work. A specimen of *N. grossulus* was swept from the low sea-blite, *Batis maritima* L., on Hog Island, March 26. *L. canus* Lec. is known from Enterprise and St. Augustine.

**Conotrachelus seniculus** Lec.—This was found to be a common weevil at Ft. Myers, La Belle and Moore Haven, where numbers were taken by sweeping low vegetation, and also at light.

**Conotrachelus belfragei** Lec. A single specimen of this handsome species was taken on Hog Island, March 14, by beating the seaside grape, (*Coc-*

*Ann. N. Y. Acad. Sci., VII, 1893, 599.

*coloba uvifera* L.). One had previously been taken at Eustis. These are the only two records for Florida, the species having been described from Texas.

**Chalcodermus inæquicollis** Horn.—This species was found hibernating in the axils of a tall thistle growing on Hog Island. A dozen or more specimens were there taken while searching for *Paragraphus setosus*. It is known also from Capron and Buck Key, Fla., and from Georgia and Arkansas.

**Tyloderma maculata** Blatch.—A single example of this prettily marked weevil was taken March 3 by beating at Moore Haven, and another on Hog Island, March 26, while sweeping *Batis*. It was described from a unique taken at Little River, Fla.

**Tyloderma lævicollis,** sp. nov.—Elongate-oval; smaller, more slender, with sides more parallel than any other of the brown forms. Dark reddish brown; the head, thorax and legs strongly shining. Head and beak rather finely, not densely punctate, without frontal fovea, the punctures isolated, not confluent or reticulated as in *variegata*; beak stout, about as long as head, carinate above. Thorax longer than wide, strongly produced over the head, sides feebly rounded; disk very minutely and sparsely punctate, each puncture bearing a minute prostrate white hair; flanks behind the ocular lobe strongly concave and coarsely punctate. Elytra one-third wider than thorax, sides parallel from humeri to apical third, then converging to the obtuse apex; striæ shallow and sparsely punctate on basal half, much deeper and without punctures toward apex; intervals feebly convex; disk with scattered small patches of white hairs, which tend to form very narrow, broken cross-bars. Last ventral coarsely punctate, abdomen otherwise almost smooth; sterna coarsely and sparsely punctate. Length 3 mm.

Two specimens taken March 4 by beating at the point where the Palm Beach Canal leaves the east shore of Lake Okeechobee. The elongate slender form, almost smooth thorax and deep, subapical striæ of elytra readily separate this from any known species.

**Cryptorhynchus apiculatus** Gyll. –This species is not so scarce as is commonly supposed. A half dozen or more have been taken at Dunedin in February and March, and one at Okeechobee City, March 6. It occurs on dead branches in wet hammocks.

**Cryptorhynchus schwarzi** Blatch.—A single example of this elongate, dull coloured form was taken near Moore Haven, March 1. The type was from the north end of Lake Okeechobee and the only other known specimens are from Biscayne Bay, so, as far as known, it is confined to southern Florida.

**Caulophilus latinasus** Say.—Hibernates in bunches of Spanish moss, numerous specimens having been taken at Lakeland, Feb. 21.

**Pentarthrinus atrolucens** Casey.—One specimen taken by beating dead branches in Skinner's Hammock, Dec. 20. Recorded before only from Enterprise and Biscayne Bay, Fla.

**Calandra linearis** Hbst.—A West India species known as the tamarind weevil. A single specimen was beaten from oak in open sandy woods near Lakeland, Feb. 22. Not before definitely recorded from Florida.

# NEW ENGLAND HEMIPTERA-HETEROPTERA.

## New Records.

BY H. M. PARSHLEY, SMITH COLLEGE, NORTHAMPTON, MASS.

Since the publication of my New England List* a number of additional species and significant records have come to light, together with a few errors which require correction. All available information on these points is brought together here in the belief that the value of such a list can be maintained only by keeping it up to date. New England records have particular interest for students of distribution in Canada, and some interesting comparisons should be brought out in connection with studies now in progress on the Hemipterous faunas of the eastern and western regions of the Dominion.

In the following notes bold-faced type is used to indicate forms new to the list; italics to mark those previously recorded. In all trinomials here and in the List the third name is varietal, not racial. For collectors' names see the List.

### LYGÆIDÆ.

*Geocoris bullatus* var. *discopterus* Stal.

MASS.—Northampton, 5 June, '18, (*H.M.P.*).

*Kolenetrus plenus* (Distant).

N. H.—Crawfords, 28 Sept., '16, (*H. M. P.*).

*Trapezonotus arenarius* (Linné).

ME.—Casco Bay (*fide* Barber).

N. H.—Claremont (*G. P. E.*) (*fide* Barber).

*Drymus unus* (Say).

MASS.—Northampton, 14 Nov. '17, (Esther W. Hall).

### TINGIDÆ.

**Corythucha pallipes** Parshley.

*In* Gibson, Trans. Am. Ent. Soc., 1918, vol. 44, p. 82.

CONN.—Stamford, 16 Aug, '12, (*W.E.B.*).

**Corythucha cyrta** Parshley.

*In* Gibson, Trans. Am. Ent. Soc., 1918, vol. 44, p. 86.

ME.—Ft. Kent, 17 Aug., '10, (*C.W.J.*); Liberty, 16 Sept., '13, (*J.A.C.*); Orono, 4, June, '07.

N.H.—Bretton Woods, 26 June, '13, (*C.W.J.*).

MASS.—Beach Bluff, 21 June '15, (*H.M.P.*); Chester, 27 May, '12, (*C.W.J.*).

**Corythucha betulæ** Drake.

*In* Gibson, Trans. Am. Ent. Soc., 1918, vol. 44, p. 86.

ME.—Cumberland, May, '16, (*A. Nicolay*) (*fide* Drake in litt.).

**Corythucha borealis** Parshley.

*In* Gibson, Trans. Am. Ent. Soc., 1918, vol. 44, p. 92.

ME.—Orono, 14 July, '11.

*Leptostyla heidemanni* Osborn and Drake.

MASS.—Sunderland, Mt. Toby, 15 Aug., '18, (*H.M.P.*).

*Occas. Papers of the Boston Society of Natural History VII, Fauna of New England. 14. List of the Hemiptera-Heteroptera, 1917.

MESOVELIIDÆ.

*Mesovelia mulsanti* White.

MASS.—Sunderland, Mt. Toby, 23 Sept., '17 (*H.M.P.*).

NABIDÆ.

*Nabis sordidus* Reuter.

MASS.—Northampton, 21 Oct., '18, (*H.M.P.*).

ANTHOCORIDÆ.

*Xylocoris cursitans* (Fallén).

MASS.—Sunderland, Mt. Toby, 11 Oct., '17, (*H.M.P.*).

MIRIDÆ.

*Paracalocoris scrupeus* var. *bidens* McAtee.

MASS.—Northampton, 22 June, '18, (*H.M.P.*).

**Paracalocoris hawleyi** var. **fissus** McAtee.

ME.—Princeton, 12 July, (*C.W.J.*).

*Paracalocoris colon* var. *amiculus* McAtee.

MASS.—Northampton, 8 July, '18, (*H.M.P.*).

**Dichrooscytus elegans** Uhler.

MASS.—Beach Bluff, 28 June, '15, (*H.M.P.*).

*Horcias dislocatus* (Say).

MASS.—Sunderland, Mt. Toby, 6 July, '18, (*H.M.P.*).

*Horcias dislocatus* var. *coccineus* (Emmons).

MASS.—Sunderland, Mt. Toby, 6 June, '18, (*H.M.P.*).

**Platylygus luridus** (Reuter).

Knight, Bull. Brooklyn Ent. Soc., 1918, vol. 13, p. 16.

N. H.—Claremont, 10 July, (*G. P.E.*).

*Lygus vitticollis* Reuter.

MASS.—Northampton, 4 June, '18, (*H.M.P.*).

**Neoborus pubescens** Knight.

Bull. Brooklyn Ent. Soc., 1917, vol. 12, p. 81.

N. H.—Hanover, 3 July (*C.W.J.*).

**Dicyphus vestitus** Uhler.

N. H.—Mt. Washington, 3,000 ft., 4 July, '13, (*C.W.J.*); Crawfords, 28, Sept. '16, (*H.M.P.*)

**Macrolophus separatus** (Uhler).

Mass.—Whately Glen, 5 Aug., '18, (*H.M.P.*).

**Lopidea heidemanni** Knight.

Ent. News, 1917, vol. 28, p. 456.

VT.—Bennington, 24 June, (*C.W.J.*).

MASS.—Natick, 20 June, '14, (*C.A.F.*).

CONN.—S. Meriden, 1 June, (*H.L.J.*).

**Lopidea reuteri** Knight.

Ent. News, 1917, vol. 28, p. 459.

MASS.—Chester, 8 Aug., '12, (*C.W.J.*); Fall River, 11 Aug.; Rutland, 31 Aug., '16, (*C.W.J.*); Sharon, 3 Aug., '09, (*C.W.J.*); Southbridge, 16 July; Williamsburg, 7 Aug., '11, (*C.W.J.*).

CONN.—Portland, 10 July, (*A. E. Moss*), 10 Aug., (*B.H.W.*).

**Lopidea staphyleæ** var. **sanguinea** Knight.

Ent. News, 1917, vol. 28, p. 461.

Mass.—Brookline, 4 July, Mt. Tom, 14 July, '07, (*C.W.J.*).

Conn.—Mt. Carmel, 24 July, (*W.E.B.*).

*Diapnidia provancheri* (Burque).

N. H.—Alstead (*A.P.M.*) (*fide* Van Duzee).

**Diaphnidia capitata** Van Duzee.

Mass.—Beverly, 23 July, '17, (*E.B.*).

**Orthotylus uniformis** Van Duzee.

Mass.—Beach Bluff, 28 July, '17, (*H.M.P.*).

*Orthotylus catulus* Van Duzee.

Conn.—Mt. Carmel, 25 May, '06, (*B.H.W.*).

**Cyrtorrhinus caricis** (Fallén).

Mass.—Cohasset, 8 Sept., (*C.W.J.*); Nantucket, 6 Aug., '13, (*J.A.C.*).

**Mecomma gilvipes** (Stal.).

Records given for *M. ambulans* (Fallén), List, p. 102, pertain to this species.

*Macrotylus amœnus* Reuter.

Mass.—Sunderland, Mt. Toby, 8 July, '18, (*H.M.P.*). Very numerous in upland pasture.

**Oncotylus punctipes** Reuter.

Me.—Calais, 10 July, (*C.W.J.*); Eastport, 15 July, '09, (*C.W.J.*).

*Reuteroscopus ornatus* (Reuter).

Mass.—Northampton, 3 Oct., '17, (*Esther W. Hall*).

*Microphylellus modestus* Reuter.

Vt.—Burlington, 22 June, '06, (*C.W.J.*).

*Campylomma verbasci* (Meyer-Dur).

Mass.—Northampton, 21 June, '18, (*H.M.V.*).

## SALDIDÆ.

**Pentacora hirta** (Say).

Conn.—Branford, 11 Aug., '04, (*H.L.V.*).

## CORRECTIONS.

Pages 8 9. In the Palæarctic list add *Scolopostethus thomsoni*, *Cyrtorrhinus caricis*, *Oncotylus punctipes*. Delete *Mecomma ambulans*.

Page 29, line 6. For (*G.P.E.*) read (*J.R.T.B.*).

Page 50, line 17. For **Rhyparochromus** read **Kolenetrus** and insert reference: Barber, Concerning Lygæidæ, No. 2, Jour. N.Y. Ent Soc., 1918, vol. 26, p. 49.

Page 51, line 14. **Delochilocoris** should probably read **Aphanus** (Barber, op. cit., p. 61).

Page 54, line 19. For **cratægi** Morrill read **cydoniæ** Fitch.

Page 82, line 2 from bottom. For **punctatus** (Zetterstedt) read var. **oblineatus** (Say).

Page 86, line 8. For Knight read Reuter. Delete the next line.

Page 107, line 11. Insert Forest Hills.

Page 119, last line. Insert additional data: 22 Aug., (*N. Banks*).

Mailed March 31st, 1919.

*ACHORUTES SOCIALIS* UZCH.

An example of the sub-order Arthropleona.
(See p. 73.)

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# POPULAR AND PRACTICAL ENTOMOLOGY.

## Remarks on Collembola.

BY CHARLES MACNAMARA, ARNPRIOR, ONTARIO.

That ingenuous character, the Man in the Street, commonly holds the erroneous opinion that an entomologist is a person who knows all about insects. Consequently, on the rare occasions when he brings some Entomological Department a "bug" to be named, if his specimen happens to be anything a little less common than a cicada or a Luna moth, he sustains a distinct shock when he finds that even the professional entomologist cannot tell him offhand exactly what it is, and must refer it to a specialist for determination. Our friend's surprise is, of course, due to the fact that he does not realize the vast, overwhelming abundance and variety of insect life; and he is not aware that no investigator, however studious, can even in the course of a whole life-time become acquainted with more than a small proportion of the prodigious number of different creatures included in the class Hexapoda.

And, besides the sole weight of numbers forcing the student of insects to specialize if he wishes to make any real progress, other influences also work in the same direction. The moths and butterflies, for instance, attract such a host of collectors as much by their beauty as by their biological interest, that there are probably more students of Lepidoptera than of all the other orders put together. Beetles, too, make a fine showing in a cabinet, and Coleopterists are legion. Then again, we are forced to give earnest if unwilling attention to those pestilent and all too numerous insects that devour our crops, bite our bodies, inoculate us with disease, or otherwise interfere with our living. All this tends to focus entomological study on certain handsome or obnoxious orders and categories, while other less showy or more inoffensive insects are passed over.

One of these neglected orders is the Collembola, familarly known as Springtails. These insects are so minute that, preserved in alcohol in tiny vials or mounted on microscope slides, they make no display in a collector's cabinet. And they are practically without economic importance. Some slight injuries to garden and greenhouse have been alleged against them, but their very worst depredations bear about the same relation to the virulent activities of say the locusts or the mosquitoes, as a small boy with a peashooter does to a German army corps invading Belgium. Consequently, they have been little studied.

Unassuming and harmless as they are, however, they have always attracted some attention. Owing to their wide distribution and, at times, extraordinary abundance, they drew some notice even from the earliest naturalists. I do not know that they are mentioned in the classic though unreliable pages of the Elder Pliny, but Linnæus did not overlook them, and with his passion for classification, duly tabulated them in his great "Systema Naturæ" under the generic name of Podura.

But a century later we find Nicolet reproaching naturalists that they have attached but little importance to the study of the order; and in 1872 Lubbock in his elaborate Monograph repeats the same complaint. Even to-day the sum of Collembola literature,—for the most part scattered through reviews and "proceedings" in half a dozen different languages—comprises only a few score papers. Nicolet's Memoir of 1841 and Lubbock's Monograph of 1872, although both beautifully illustrated with drawings and coloured pictures of an excellence seldom seen in modern insect books, are not nowadays of much use to the systematist. Linnaniemi's large Memoir (1907–1912) on the Apterygotan fauna of Finand is very useful to the American student, as many European species occur here. Guthrie's "Collembola of Minnesota" (1903) is the most comprehensive American volume, but the collector in this part of the country soon comes across numerous species not mentioned by Guthrie. However, Dr. J. W. Folsom, of the University of Illinois, the well-known authority on the Order, has lately published several exhaustive memoirs on certain of the North American sub-families, and I understand has others in preparation, so we may hope to have soon accurate and authoritative descriptions of all the known species on this continent. And we should be glad of this, for the Collembola are well worthy of study. The economic entomologist with his mercenary instincts may elect to ignore them, but their exceedingly primitive development makes them intensely interesting to the student of insect genealogy; while the astonishingly wide dispersal of some of their species and genera over the globe points to the immense antiquity of the Order, and sets some hard problems for the geologist to account for the primordial distribution of land and water.

If the bees and the ants be regarded as the aristocrats of the insect world, we must look on the springtails as belonging to the submerged tenth. They are among the most primitive of the "six-leggers." Some writers class the Thysanura as the lowest of the true insects, while others confer that doubtful honour on Berlese's Mirientomata; but all agree in placing the Collembola second on the list, only one step above the simplest known hexapods. The Order is divided into two suborders: the Arthropleona and the Symphypleona—which may be translated as the "Jointed-abdomens" and the "Together-grown-abdomens." The terms well express the difference in the appearance of the two divisions. The Arthropleona, which are considered the more primitive, have a well-marked head carried horizontally and bearing a pair of antennæ usually four jointed (but six jointed in one genus). The thorax consists of three conspicuous segments each with its pair of rather short legs, and the elongated abdomen is made up of six distinct divisions. In the Symphypleona the head is vertical, the constricted prothorax simulates a neck, while the other thoracic divisions are fused with the abdomen into an unsegmented globose body, the insect somewhat resembling a minute spider. (See plates III and IV.)

All the Collembola are without wings, and as no trace of these appendages can be found in the embryo at any stage of its growth, it is apparent that the wingless condition is primitive, and not the result of degeneration, as in the case of numerous other insects. Typically the mouth-parts of both sub-orders are withdrawn within the head, and are adapted for chewing, but in a few genera they project in a suctorial cone.

About 700 species of Collembola have been described so far, and of these some 200 have been found in North America. But there are certainly a large number to be discovered yet. Dr. Folsom estimates the collembolan fauna of this continent at not less than 250 species..

They are all very small, delicate insects, ranging from one-half millimeter to five millimeters in length, but the commonest kinds are from one to two millimeters long. Their integument is very soft, and great care is necessary in handling them. Most of them are clothed, thinly or densely, with hairs of a remarkable variety of form. There are long, slender, simple hairs, and stiff, spiny bristles; there are wide, ribbon-like hairs, and hairs terminating in fancy spear heads and in cups; there are hairs with flat, broad bases notched along one edge; there are feathered hairs, clubbed hairs and hairs bent over sharply at the ends. Of course, no one species possesses all these different kinds of hairs, but most springtails can boast of three or four varieties at least. For convenience sake, we speak of these growths as hairs, but they have little in common with the hairs of a mammal that grow out through the skin like an onion in a garden bed. A springtail's hairs are really continuous outgrowths of the integument, and when the insect moults its skin, as it does frequently in the course of its life, it sheds the outer layer of these so-called hairs also.

A few genera are covered with scales, not unlike the scales on a butterfly's wing, but very much smaller. These scales are lined and fluted so minutely that they are often used as test objects for microscopes, and the exact nature of the markings appears to be as hard to make out as the pattern on a diatom.

In colour the Collembola run through the whole spectrum from red to violet with black and white thrown in. Some are coloured uniformly all over, some are irregularly blotched and spotted and some wear veritable Joseph's coats of complicated symmetrical designs. Most of the colour is pigmentary, but the scaled species often show beautiful iridescence.

Some species are very constant in their coloration, while others assume several different liveries according, it would seem, to their food or their habitat. Thus *Sminthurus hortensis* Fitch, taken on garden beds, is a very dark purple with minute yellow spots, whereas a bright yellow variety, indistinguishable in everything but colour, is found living in the adjacent grass. *Achorutes armatus* Nic. may be a dirty white, pale violet, wine colour, or dark blue; and one variety, Dr. Folsom says, is canary yellow mottled with lavender. The common and abundant *Podura aquatica*, known all over the northern hemisphere, has always been described from the time of Linneus himself as dark blue with red brown legs and antennæ. But *P. aquatica*, recently found in the vicinity of Arnprior, Ontario, is coloured uniformly red all over. Indeed, variations of this kind are so common among the Collembola that colour is scarcely of any diagnostic value at all.

The most striking feature of the Collembola is the leaping apparatus to which they owe their popular name of Springtails. This apparatus is not characteristic of all the Order, however, for there are a good many species without any springing device at all, and in others it is so poorly developed as to be inoperative; but the majority are active jumpers. The apparatus, which is known as the furcula, consists of a forked appendage, (the dentes) hinged by a broad base, (the manubrium), to the belly at the fourth abdominal segment.

and is normally folded under the insect with the free forked end towards the head. The dentes terminate in curious hooked and toothed pieces (the mucrones) plainly designed to give the insect a firm purchase for its leap; and with the same object in view, the underside of the dentes are often studded with spike-like setæ. The acme of stinginess is reputed to have been reached by a man who used a wart on the back of his neck for a collar botton. Without accusing the springtail of parsimony, it must be stated that it adopts much the same means to hold its furcula in place. On the third abdominal segment is a curious little double-fingered protuberance (the tenaculum) which, when the furcula is folded in place, projects between the dentes. The fingers of this excrescence each provided with three or four teeth to ensure a firm grasp—bending outwards against the dentes, serve to hold the furcula close along the belly, where it is under considerable tension from the muscles of the manubrium. When the fingers of the tenaculum are relaxed, these muscles pull the furcula strongly downwards and backwards, and the insect is flung upwards into the air. Anyone who remembers that homely toy, the goose-bone jumping jack, that used to delight the children of a past generation, will readily understand how a springtail leaps.

The length of a jump may be as much as five or six inches. An *Achorutes socialis*, one millimeter long, easily springs four inches or 100 millimeters, and *A. socialis* is by no means one of the most active species. In proportion to the size of the insect, these are prodigious leaps. It is as if a man could cover a mile in nine or ten bounds.

While in the air, the insect folds the furcula back into place again, so that on alighting it is immediately ready for another leap, and it almost invariably comes down on its feet. Only a few species, however, such as *Tomocerus flavescens*, jump several times in quick succession. Generally there is an interval of half a minute or more between the leaps. And, as a rule, leaping is only resorted to in order to escape from danger. The usual mode of progression is walking or running by means of the legs; although the migrating kinds when on the march, keep leaping from time to time, but apparently largely at random.

While the springing apparatus is the most noticeable structure of the majority of the Collembola, it is not the distinguishing mark of the Order, for, as already mentioned, a good many species are entirely without it. It is the possession of the mysterious organ known as the "ventral tube" that decides the springtail lineage. This organ, situated ventrally on the first abdominally segment, is in some species merely a cleft tubercle, the sides of which open back like the jaws of a steel trap, exposing a wet, stickly-looking disc within. In other species it takes the form of a relatively long, projecting tube, from which (among some of the Symphypleona) can be protruded two lengthy, slender, transparent filaments, thickly studded with circular glands.

Dissection does little to explain the use of the organ, but Sir John Lubbock named the order Collembola—literally "glue-insertion"—from the idea, common to most entomologists of his day and apparently still held by some writers, that the ventral tube enabled "the creature to attach or glue itself to the body on which it stands." That this is the special function of the organ seems very doubtful. Springtails do not appear to be in any particular need of attaching themselves so securely to surfaces. They do not habitually live upside down,

nor are they especially exposed to shocks that might shake them loose from their hold. And Guthrie is mistaken in saying that their feet are not well adapted for smooth surfaces. It is true that the feet are lacking in any kind of a pad or sucker; and it is not likely that the two or three clubbed or geniculate setæ—the so-called tenent hairs—that in some species project over the usual pair of curved pointed claws, are anything more than tactile in function. But however they manage it, the thirty or forty species that I have observed in life, whether with two claws on each foot or only one, and with or without tenent hairs, could all run nimbly on dry, polished glass, even back downwards; and such a surface is infinitely harder and smoother than any they ever encounter in their natural habitat.

In support of his opinion that the ventral tube is an organ of attachment, Lubbock says that if a Sminthurus is laid on its back and a piece of glass is brought within its reach, "the animal will endeavour to seize it with the feet, but at the same time it will project one or both of the ventral tentacles and apply it, or them, firmly to the glass, emitting at the same time a drop of fluid which, no doubt, gives a better hold." This surmise may sound plausible in the particular instance, but an extended observation of the actions of different species as regards the ventral tube leads to another view of the probable function of the organ.

The Collembola are all extremely sensitive to any lack of humidity in their surroundings. Most species, if put into a dry vial, will die and begin to shrivel up within an hour. The only way to keep them alive in captivity for any length of time is to put in the vial some source of moisture such as wet, rotten wood or damp filter paper. Evaporation through the thin epidermis is so rapid, that it appears not unlikely to me that the ventral tube has to do with supplying or regulating the large quantity of moisture the insect requires.

This conjecture seems to be borne out by the conduct of more than one species. For instance, a yellow Papirius—(a genus closely related to the Smynthurus mentioned by Lubbock) found in the autumn under dead leaves of hardwood forests, stands high on its legs, neither its ventral tube nor any other part of its abdomen normally touching the surface it rests on. In a vial, it has no trouble in walking on the glass in any position; and it remains for hours and even days clinging to the glass, back downwards, by its feet alone, maintaining its hold without any help whatever from the ventral tube.

Of a dozen or so of this species kept in a vial with the usual morsel of moist, rotten wood or damp filter paper, the majority remain thus motionless for long periods. Then suddenly, with startling swiftness, one of them shoots out its ventral filaments on either side of its body, and applies them closely to the glass along their whole length, always—so far as I have observed—where there is a film of moisture on the glass. The filaments, which are tubular and provided with a number of sucker-like glands at the ends, are longer than the insect's entire body, but are evidently stowed away by the smaller apical half telescoping into the larger basal section. After leaving the filaments in contact with the glass for a minute or two, the insect draws them in as swiftly as it shot them out, changes its position slightly, and darts them out again. This performance may be kept up for ten minutes or so, and then finally drawing in the filaments permanently, the insect lapses into quietude again.

This Papirius makes use of its ventral filaments also when washing itself, which it does frequently, very much like a cat. From its mouth it exudes a small, bright drop of liquid, and taking it on the claw of one of the forelegs—where it looks like a gleaming boxing glove—it rubs it briskly over its antennæ, head and legs. Sometimes it transfers the drop to the claw of one of the second pair of legs so as to reach farther down the body. The drop often remains unbroken during these proceedings, and with laudable economy, is then returned to the mouth and swallowed again. The washing operation almost invariably ends by the swift extrusion of a short piece of one of the ventral filaments, which is also apparently rubbed over with the remains of the drop; or moisture is transferred between it and the mouth. But the action is so rapid that I have never been able to make out exactly what occurs.

Guthrie observes of *Orchesella zebra*, which one morning after a shower he found in great numbers on the moist surface of stumps in the woods, that "they moved about fitfully at time, but often stopped and squatted down to bring the ventral tube into contact with the moisture." And some additional light is thrown on the use of the organ by watching the conduct of *Achorutes socialis* Uzel in a vial. The ventral tube in this species is simply a low cleft protuberance, which on opening, exposes a wet, sucker-like disc. When the vial containing a number of newly caught *A. socialis* is laid on its side, the insects first run around busily in every direction, maintaining their hold on the glass in every position without any assistance from the ventral tube. But every now and then, one of them opens the tube, and applies the disc to the glass. It still keeps its legs going, but now can only drag itself along slowly, as the attachment to the glass greatly impedes its way. In a few moments it withdraws the disc—sometimes leaving a trace of moisture on the glass,—closes the tube, and runs off briskly as before, only to repeat the action a little later on. After awhile, the insects quiet down, and come to rest closely packed side by side all around the circumference of the bottle. Many of those that are hanging back downwards are seen to have the ventral tube applied to the glass; but this cannot be merely for support, for the insects resting on the lower side of the bottle, where no attachment is necessary to maintain their position, are found, with few exceptions, to have their tubes in contact with the glass also. And a few hours later the still, motionless insects all around the bottle are discovered to be holding by their feet alone, with their ventral tubes without exception all closed.

To me, the evidence points strongly to the conclusion that the ventral tube is not primarily intended to maintain the insect's hold, and the probability is great that it acts as a kind of regulating valve, controlling and supplementing the supply of moisture.

Nor does the suggestion that the ventral tube is a breathing organ seem any better founded than the "attachment theory." The fact that the Collembola—with the exception of one or two genera of the Symphypleona—are without air tracheæ might seem to lend weight to the hypothesis. But Sminthurus and one or two others which alone have a tracheal system, also have the most highly developed type of ventral tube with long, extensible filaments, and it is against all the economy of nature that two distinct sets of apparatus should be provided for the same purpose.

In addition to the conspicuous organs we have been discussing, the Collembola display several minor structures that no doubt are sense organs of some kind, but what their precise functions are, and indeed what senses the insects really possess, we can only guess. Many species seem to get along quite well without sight, and the eyes of those endowed with vision are very simple constructions compared with the enormous compound eyes of some of the flying insects. The sense of touch—the most primitive of all the senses, and common to every manifestation of life—is doubtless served by the numerous strange "hairs" that cover the insects' bodies as well as by the antennæ. The very necessary sense of taste it is reasonable to suppose is situated in the mouth. And possibly the closely-allied sense of smell has its seat in the curious depressions each with a "peg" in the centre that sometimes indent the sides of the antennæ, or in the remarkable buds and tubercles often seen on the same organs. But it is hard to divine the use of the strange bladder-like sac that *Achorutes armatus* Nic. can evert from between its last two antennal segments. Equally mysterious are the "post-antennal organs," those rosettes of scales situated on the head between the base of the antennæ and the eyes in many species. They may be auditory, but, of course, we have no evidence that the insects can hear at all. Another peculiar feature of certain species are the two or three sharp, curved spines that grow out of the last abdominal segment. But whatever use these "anal horns" are to the animal, at least they justify their existence to the puzzled entomologist by helping him in the often difficult task of determining the species.

As the systematic observation of such minute insects in their habitat is practically impossible, and as it is very difficult to keep them in captivity under natural conditions, the details of their life-history are not well known.

The Collembola pass through no larval stage, and undergo no metamorphosis whatever. The white or yellow spherical eggs, about one-eighth of a millimeter in diameter, are generally quite smooth, although Nicolet figures some hairy ones. They are laid singly or in masses like bunches of grapes under bark, among dead leaves and in many other damp situations. The masses often contain from 50 to 100 eggs, and bulk much larger than the body of the insect, but are usually all stuck together with every appearance of being the product of one female. Oviposition apparently takes place only in the dark. Several species lay eggs freely in captivity, but I have never been able to observe the operation; and an English writer says that in 50 years' study of the insects he has never succeeded in seeing how the eggs are laid. Until some one discovers how to circumvent this coyness of the mother springtail, we shall not know whether, despite appearances, more than one female contributes to the egg cluster, or whether we must accept the decidedly improbable suggestion that the eggs increase in size after laying.

Incubation at room temperature takes from 10 to 35 days, according to the species. The large variation in the size of individuals of the same species taken at the same time points to more than one brood in the season, but they are so difficult to rear that exact data on this point are lacking. In captivity, *Achorutes socialis* Uzel and some other species lay only in the spring, while

*Achorutes humi* Folsom and *Neanura muscorum* Templeton oviposit late in the fall. The eggs of the last-named took 35 days to hatch at an average temperature of 60 F. This is a remarkably long period compared with the 10 or 12 days required by the eggs of *Achorutes socialis* under the same conditions; and in the insects' natural habitat incubation would doubtless have been even longer, for the young Neanura appeared in my bottles on the 8th January; and in their native wilds, sheltered from the intense frost only by the bark of a rotten log, it is scarcely likely that they would have hatched before spring.

On emergence from the egg, the young of a two millimeter adult are about one quarter of a millimeter long, and are invariably white, with—except in the blind species—conspicuous black eye spots. They are perfectly developed, but are not of quite the same proportions as the adults,—being somewhat shorter and thicker—and are wonderfully active runners and jumpers. Their growth seems to be slow, but it is scarcely safe to generalize on this point from the progress of the young in captivity, for they do not thrive under artificial conditions. *Achorutes socialis* and *Achorutes packardi* captured when well grown, have lived for six to eight months in my vials, and it was more than a year before senile decay carried off *Xenylla maritima*. But though I have seen the young of half a dozen species hatch out, not one of them ever survived longer than two or three weeks; and during this brief life I could never notice any marked change in their appearance.

Some species at least are sexually mature a good while before they attain their maximum size. *Achorutes socialis* reaches a body length of two millimeters, but specimens only one and a quarter millimeters long lay eggs. The number of moults, so constant with many insects, is I suspect with them indefinite, for they seem to keep on shedding their skins and growing as long as they live. The largest sized specimens of several species that I am familiar with are found only in the spring. Apparently belonging to some brood of the year before, in spite of the almost sub-arctic cold of this district, they have continued to grow all winter in their shelters under the snow.

Their food seems to consist of organic matter of almost any kind. They have been found feeding on dead molluscs, fish and birds along the shore, but probably vegetable substances supply most of their nutriment. The mandibulate mouth-parts possessed by the majority are obviously designed for chewing. Some of the species I have had under observation fed on rotten wood, moss and lichens; others—notably the Arthropleona—would not eat at all in captivity.

No matter how small you are, trouble won't overlook you, and even the minute springtail has its enemies. Lubbock and some others refer to the presence of Protozoa in the internal organs of Collembola, and Imms found Nematodes in *Anurida maritima*. Nor are external parasites wanting. Of twelve or fifteen specimens of a small Sminthurus I collected last summer in the long grass of a beaver meadow, five had still smaller red mites firmly attached to them. This genus seems to be subject to attack by mites, for Lubbock mentions the same occurrence in connection with *S. fusce* (L.). Other likely enemies of the Order are the tiny spiders and chelifers, the thread-legged bugs and other predaceous creatures that one often finds in the collembolan habitats.

*SMINTHURUS HORTENSIS* FITCH.

An example of the sub-order Symphypleona.
(See p. 73.)

# NEW PSAMMOCHARIDÆ AND PHILANTHIDÆ.

BY NATHAN BANKS, CAMBRIDGE, MASS.

The following new species are mostly from the northern and northwestern parts of the United States or from Canada.

## Psammocharidæ.

**Psammochares lasiope,** n. sp.

♀ Black, basal part of abdomen reddish above and below, extreme base of first segment black. Head, pro- and metanotum densely clothed with rather long hairs. Clypeus truncate, margined; antennæ slender, second plus third joints fully equal vertex width, vertex from in front hardly convex; the lateral ocelli nearer to each other than to the eyes; hind border of pronotum angulate; base, tip, and venter of abdomen with few fine hairs, no bristles near tip of abdomen; legs slender, with short spines, three in comb on basitarsus, not very long; inner spur of hind tibia about one-half of the basitarsus. Wings nearly uniformly blackish, but not very dark; second and third submarginals subequal in size, both broad above, separated by a vertical vein, and receiving the recurrent veins near the middle; basal vein before transverse; in hind wings the fork is interstitial with the end of the cell.

Length 11 mm.

From Saranac Lake, 26 Aug.; Wilmington, 20–26 Aug.; New Russia, Essex Co., 18 Aug., all in New York, (Bradley). Differs from *atlanticus*, *autumnalis*, *marginalis*, in having longer hair on metanotum and broad-topped third submarginal cell; the spines of the comb are about the length of those in *marginalis*, much shorter than in *autumnalis* and *atlanticus*.

**Anoplius depressipes,** n. sp.

♀. Deep black throughout; wings uniformly black. The face is rather broader below than above, the clypeus very broad, nearly truncate below, but rounded at outer sides, vertex straight across, hind ocelli about as close to eyes as to each other, antennæ slender, second plus third joint equal vertex width; pronotum behind angulate, metanotum sloping, not very long, with a deep median groove, with long hair. Abdomen slender, basal and apical segments hairy above, all below; legs slender, not very spiny, those on the tibiæ hardly one-half of the width of joint, inner spur of hind tibia about one-half of basitarsus, anterior tarsi flattened, the outer edge angulate, concave below, no spines above on basitarsus, 2 in the concavity on lower outer side. Wings moderately long, second submarginal cell longer than wide, receiving the first recurrent beyond middle, third submarginal fully as long as the second, narrowed above, receiving the second recurrent vein near middle, latter curved, basal vein a little before the transverse; in hind wing the fork interstitial with the end of the cell. The head and thorax are clothed with rather long hair.

Length 12 to 16 mm.

From Ithaca, N.Y., 12 July (Needham); Spring Creek, Decatur Co., Ga., 16 July, (Bradley) and Burton, Ga., 21 May, (Bradley).

The nature of the anterior tarsus, especially the basal joint, will distinguish it from our other species of this genus.

**Anoplius similaris,** n. sp.

♀. Black throughout; wings uniformly black. Closely to *A. illinoiensis*. The clypeus is broadly, evenly concave below, in *illinoiensis* it is truncate and consequently longer. The face is a little broader at vertex than in *illinoiensis;* antennæ and ocelli about the same as in that species; the metanotum is a little shorter, more deeply grooved, the posterior slope more flattened across, the hairs shorter and much fewer than in *A. illinoiensis*. The abdomen similar but the last segment has only a few fine hairs, not the stiff bristles of *A. illinoiensis*. Legs slender, hardly as spiny as in *illinoiensis*, the inner spur of hind tibia a little more than one-half of basitarsus; the front basitarsus has no noticeable spines above, but two or three on the outer under side. Venation similar to *A. illinoiensis*, but submarginal cells a little larger, and the second recurrent vein not curved.

Length 15 to 16 mm.

From Ithaca, N.Y., 14, 25 July, (Bradley).

**Lophopompilus autilone,** n. sp.

♂. Related by the male genitalia to *L. æthiops*, differs in that there is a median, hairy ridge the whole length of the genital plate (in *æthiops* only at base). The under side of the first joint of the antennæ is hardly hairy; the hairs on the metanotum are not nearly as long or as dense as in *æthiops*, and the whole body is less hairy. The clypeal margin is slightly concave; the third submarginal cell is triangular, receiving the second recurrent vein near the middle, the latter bent near the middle; hind margin of pronotum almost angular; apical ventral segments with scattered hairs only.

Length 14 mm.

From La Belle, 8–10 May, Ft. Meyers, 7 May, Florida, and Billy Island, Okefenokee Swamp, Ga., all taken by Prof. Bradley.

**Pompiloides canadensis,** n. sp.

♀. Similar to *P. cylindricus* and *P. insolens;* differs from both by the shape of the basal plate of male genitalia being triangularly emarginate, the sides of the emargination divergent (instead of parallel); the last ventral segment is not so deeply emarginate behind as in *P. cylindricus*. Black throughout, not as much silvery as in *P. cylindricus*, the silvery appearance noticeable on face, thorax and coxæ. Head with rather longer hair than *P. cylindricus*, venter with few, but distinct hairs. Third submarginal cell usually short petiolate, the second sub-quadrate. About the size of *P. insolens*.

From Truro, Nova Scotia, 12 Aug., (Matheson); and Val Morin, 29–30 July, Canada (Ouellet).

**Sophropompilus quadrispinosus,** n. sp.

♀. Deep blue; wings blackish, nearly uniform, legs and antennæ black; clothed with short hairs. Clypeus truncate, third antennal joint hardly equal first, faint line to anterior ocellus, hind ocelli nearer to each other than to the eyes, vertex from in front slightly convex, pronotum arcuate behind; metanotum short, hairy, faint groove on the base; abdomen with short hairs above, longer at tip and below; femora plainly hairy above, inner spur of hind tibiæ two-thirds of the basitarsus, front tarsus has four long spines in comb on the first joint, these are almost flattened; wings and venation as in *S. hyacinthinus*.

Length 10 to 12 mm.

From Long Beach, L. I., N.Y., Aug., (Shannon); Chesapeake Beach, Md., 18 to 21 Sept.; Gulfport, Fla., April, (Reynolds); Billy's Island, Okefenokee Swamp, Ca , 1 to 5 Sept., (Bradley), and Tybee Island, Ga., (Bradley); evidently a coastal species. Body and legs more hairy than *hyacinthinus*, and with longer comb, four on first joint.

**Ageniella eximia,** n. sp.

♂. Black, apical parts of legs more brown; wings slightly fumose, not darker on tips. Small and very slender; face rather broad, hardly narrowed below, lateral ocelli plainly nearer to each other than to the eyes; pronotum behind strongly arcuate, metathorax sericeous on its sides. Abdomen very slender, basal segment about one and a half times longer than broad at tip; inner spur of the hind tibia little more than one-half of the basitarsus. Wings slender, rather short, marginal cell not its length from wing-tip, third submarginal higher than long, slightly narrowed above, receiving the second recurrent a little before middle, basal vein a little before the transverse.

Length 3½ to 4½ mm.

From Falls Church, Va., Ithaca, N.Y., 15 July to 10 Aug., (Bradley), Albany, and McLean, N.Y., 3 July.

Related to *A. iridipennis* Cress., but very much smaller, darker spurs and front legs, and slightly different in venation. Several specimens have the apical part of hind femora reddish, but otherwise agree.

**Agriogenia, n. gen.**

Based on *Agenia brevis* Cress. It agrees in general with *Ageniella*, but differs in being clothed with a fine, appressed, greyish yellow pubescence; the legs, especially the femora, are shorter and stouter than in *Agenia*, and the shape of marginal cell and third submarginal was noted by Cresson. The female, however, has on the underside of the head back of the mouth a curved row of long white bristles which look as though arranged to hold food. Nothing similar occurs in *Ageniella;* the head is flatter in the frontal region than in *Ageniella*.

PHILANTHIDÆ.

**Cerceris completa,** n. sp.

Male from Claremont, California, (Baker). Black, with yellow marks; face below antennæ, base of mandibles, stripe on scape beneath, spots on pronotum, the postscutellum, and legs (except basal two-thirds of femora, yellowish. Basal segment of abdomen black, second yellow above, with a median transverse black spot, pointed at each side, the following segments yellow with large basal, transverse, black spot, that on the third and fourth segments narrowed at extreme base; the venter with pale bands on second, third and fourth segments broader on sides, fifth with spots on side. Clypeus truncate in middle below; hair lobes small; enclosure smooth and shining; first abdominal segment plainly longer than broad, and not one-half the width of the second; other segments broad; pygidial area once and two-thirds longer than broad at base, rather broader at base than elsewhere. Body rather finely and densely punctate; head, thorax, and first segment plainly hairy; stigma yellowish.

Length 11 mm.

**Cerceris snowi,** n. sp.

Males from Tucson, Arizona (Snow) and San Diego Co., Cal., (Van Duzee). Black; lateral face marks, scape beneath, two spots on pronotum, the postscutellum, tegulæ, apical bands on the second and following segments, cream yellow, those on face nearly white; band on second segment much broader than others which are narrow and may be broken each side; tibiæ and extreme tips of femora pale, a dark spot behind on mid and hind tibiæ, the basitarsi pale. Flagellum of antennæ rather rufous beneath, especially toward tip. Face below densely white-haired; clypeal margin at middle faintly tridentate; enclosure smooth; the pygidial area elongate, about as in *C. kennicotti*. Head, thorax, first and second segments very plainly hairy. One specimen has two small spots on first segment, two have faint lateral spots on the scutellum.

Length 8 mm.

By small size and coarse punctuation related to *C. erigoni* and *C. acanthophila*, but distinct by having clypeus all black.

**Cerceris interjecta,** n. sp.

Male from Lake Point, Utah, 18 July, (Titus).

Black marked with yellow; first abdominal segment red above and below. Face with middle clypeal spot not reaching lower margin, and lateral spots yellow, sides of clypeus and the mandibles black; basal part of flagellum slightly rufous beneath; two spots on pronotum, the postscutellum, and broad abdominal bands, yellow, that on the second segment occupying one-half of the segment, not emarginate; third, fourth and fifth broadly emarginate in front, but on sides reaching the front margin of the segment, sixth with a small basal, median dark spot; venter all black; legs black, the tibiæ yellow in front, tarsi dark brown; stigma yellowish; pygidium mostly rufous. Face very broad; clypeal margin slightly rounded, hair-lobes very small; last joint of antenna as long as preceding, slightly curved; enclosure large, smooth, polished; pygidial area once and one-half longer than broad, sides nearly parallel. Body moderately, coarsely punctate; abdomen broad, basal segment.

Length 10 mm.

**Cerceris abbreviata,** n. sp.

Males from Yakima River, Little Spokane, and Umatilla, Washington, June and July, (S. Henshaw).

Black, marked with yellow, face, base of mandibles, scape beneath, dot behind eyes, pronotum, tegulæ, postscutellum, two spots on basal segment, narrow bands, all about of the same width on following segments, yellow; three pairs of ventral spots, usually connected; legs yellow, front and mid femora with black spot near base, hind femora and tibiæ black near tips; stigma yellowish; flagellum rufous beneath, last joint of antenna rufous, slender, curved. Face is narrower than *C. occipitomaculata*, the lateral lobes of clypeus being proportionately higher. Clypeal margin truncate; enclosure plainly longitudinally striate, but on sides more oblique; basal segment of abdomen very broad; pygidial area elongate, the sides parallel; head and thorax short-haired.

Length 8 mm.

In appearance a *C. nigrescens* marked with bright yellow instead of white, but a slightly smaller, and shorter bodied species.

**Philanthus yakima,** n. sp.

Washington—Yakima, 2 to 4 July, 1882, (S. Henshaw).

♀. Close to *P. flavifrons*, but smaller. Face, mandibles, scape beneath, streak behind eyes, two dots on vertex, collar, tegulæ, tubercles, spot behind, larger spot below, spot at posterior corners of mesonotum, adjoining spot each side on base of scutellum, postscutellum, spot each side on metanotum, broadly interrupted bands on first and second segments, bands on others, broad on sides, very narrow in middle, that on third deeply indented each side behind, broad bands on second, third and fourth ventral segments, all yellow. Legs (including coxæ) yellow, basal part of femora, rather more than one-half on hind femora, and spot toward tip of hind tibia black. Underside of flagellum rufous; stigma yellow. Punctured as in *flavifrons*, striately on front, few on mesonotum, rather deeply and evenly scattered on abdomen, but hardly as large as in *flavifrons*. Differs from *flavifrons* in that the enclosure has the posterior as well as lateral margins raised and smooth, making a horse-shoe-shaped area. The last dorsal segment is broadly triangular, and the sides not concave toward tip as in *flavifrons*.

Length 10 mm.

## FURTHER NOTES ON THE LATIMANUS GROUP OF THE BEE GENUS MEGACHILE.

BY F. W. L. SLADEN, APIARIST, DOMINION EXPERIMENTAL FARMS.

In the Agricultural Gazette of Canada, February, 1918, page 125, I proposed the name *diligens* for *Megachile latimanus*, Ckll. not of Say. Professor Cockerell has informed me that the name *diligens* was given by F. Smith in 1879 to a *Megachile* in the Hawaiian fauna, so that it becomes necessary to find a new name for *latimanus* Ckll., and I propose *dentitarsus*. The difference between this and the other Canadian species of the *latimanus* group were pointed out in my table given in the Canadian Entomologist, September, 1918, page 302. There is, however, another character to which Professor Cockerell has called my attention. When the abdomen is viewed from above and slightly tilted, black hairs are prominent laterally in *dentitarsus* (*latimanus* Ckll.), but no black hairs project at side in *perihirta*, Ckll. (*grindeliarum* Ckll.).

## OCCURRENCE OF THE PEAR THRIPS IN ONTARIO.

BY WM. A. ROSS, DOMINION ENTOMOLOGICAL LABORATORY, VINELAND STA., ONT.

The notorious pear thrips *Tæniothrips inconsequens* Uzel, hitherto unrecorded in Ontario, was taken by the writer last spring (1918) on pear trees in a large orchard near Beamsville. Fortunately the thrips was present in very small numbers and apparently was not causing any appreciable injury.

Thanks are due to Mr. P. J. Parrott, of the Geneva Agricultural Experiment Station, and Capt. J. D. Hood, Washington, D.C., for confirming the identification of this insect.

For the information of the reader it should be stated here that an excellent, detailed account of the known distribution, life history, habits and control of the pear thrips is given by A. E. Cameron and R. C. Treherne, of the Dominion Entomological Branch, in Bulletin No. 15—"The Pear Thrips and Its Control in British Columbia."

## NOTES ON THE LIFE-HISTORY AND EARLY STAGES OF BRACHYS OVATUS WEB., AND BRACHYS AEROSUS MELSH.

BY HARRY B. WEISS AND ALAN S. NICOLAY, NEW BRUNSWICK, N.J.

Packard in his "Forest Insects" records *B. aerosus* as occurring on oak early in summer in Maine and late in May near Providence, R.I., and states that Gillette (Canad. Ent. July, 1887) reared it from larvæ in poplar leaves, the mines being finished in October and the beetles appearing early the following May. Concerning *B. ovatus*, this species is recorded by Packard as follows "on laurel oak; imago issues latter part of April and early May (Riley's unpublished notes)." Gillette also reports rearing the beetle from a larva mining a leaf of either red or black oak. Felt (N. Y. State Mus. Mem. 8; 2, p. 512–3) states that *B. aerosus* was taken while feeding on elm during the latter half of May, and that *B. ovatus* was common on scrub oak the latter part of May and June. Blatchley in his "Coleoptera of Indiana" records *aerosus* as throughout the state, frequent, May 16–June 18, occurring on oak, hickory, elm and *ovatus* also as throughout the state and frequent, May 16–July 13, on oak in the leaves of which the larvæ dwell. According to Smith (Rept. N. J. State Mus. 1909) *aerosus* is found throughout New Jersey, not rare, on oak, May, June and *ovatus* is common throughout the state, June to August on oak. Burke (U. S. Dept. Agric. Bull. No. 437, 1917) summarizes the distribution, common habits and host trees of the genus *Brachys* as follows:—"Eastern and Central States, leaf miner in leaves: *Populus* ?, alder (*Alnus*), *Fagus* ?, chestnut (*Castanea*), oak (*Quercus*), *Ulmus* ?, and *Acer*?"

In New Jersey, we have found the distribution of both species to be as reported by Smith, and have observed the adults feeding on foliage as follows: *B. ovatus* on elm (*Ulmus americana*), sugar maple (*Acer saccharum*), white oak (*Quercus alba*),chestnut oak (*Q. prinus*),pin oak (*Q. palustris*), chestnut (*Castanea dentata*), scrub oak (*Q. ilicifolia*), black oak (*Q. velutina*), post oak (*Q. minor*), beech (*Fagus ferruginea*), and hickory (*Hicoria glabra*) with the various species of oaks as preferred food plants; *B. aerosus* feeding on beech (*F. ferruginea*), linden (*Tilia americana*), witch hazel (*Hamamelis virginiana*), elm (*Ulmus americana*), chestnut (*C. dentata*), sugar maple (*A. saccharum*), red maple (*A. rubrum*),and various species of oaks with the oaks as preferred food plants, although quite a few adults were taken while feeding on red maple and beech.

The feeding of both species is quite characteristic. The beetles feed on the upper leaf surfaces usually near the edges consuming the tissue between the larger veins and working, as a rule, along a large vein. This habit results in feeding areas which are bounded on one or more sides by straight edges or lines giving the injury a sort of ragged geometrical appearance. After much feeding has been done at one spot, the small amount of remaining uninjured tissue weathers away in the course of time, resulting in irregular holes.

The mines of both species are somewhat irregular and blotch-like and may be found on any part of a leaf, the majority, however, occurring near the edge. As a rule each mine contains only one larva, and is found on a leaf which is comparatively uninjured by adult feeding. *Aerosus* mines take up only a small portion of a leaf, while an *ovatus* larva will frequently mine one-half or more of a medium-sized leaf. The mines of both species are visible on both leaf surfaces, more so on the upper where they appear as brown dead spots or areas. Some

VARIOUS LEAVES SHOWING BRACHYS. SP. FEEDING.

leaves when held up to the light are so mined that the characteristic larva is readily identified as a *Brachys* sp., while others have the mined area so brown that the light will not penetrate. However, a *Brachys* sp. mine can usually be identified as such by the dried, oval, flat, glistening egg shell which remains sticking to some portion of the upper surface of the mine long after the larva has left it. Mined leaves were found on small as well as large trees. On the large trees, however, only the outer leaves exposed to plenty of sunlight were infested.

Not all of the trees selected as food plants by theadu lts seem to harbour the larvæ in their foliage, and we have observed mines of both species only, as a rule, in the leaves of various oaks. In a few cases we have noted mines on chestnut and have taken larvæ therefrom. At Uhlerstown, Pa., eggs and adults of *B. aerosus* were plentiful on red maple leaves, but an opportunity for visiting this place later in the season was not afforded us, and it is not known if the leaves were mined.

In general, the life-history of both species is as follows. Adults appear about the middle or latter part of May and disappear by the first part of August, being most plentiful during June and the first part of July. Soon after emergence and feeding, eggs are deposited on the upper leaf surfaces, many being laid near the edges. After hatching, the larvæ mine the leaves until the latter part of August and September, at which time many leave the mines through the lower surface and drop to the soil where pupation takes place. Sometimes it is possible to find larvæ in their mines as late as the middle of October. The winter is evidently passed in the pupal stage, as a specimen under our observation pupated during the first part of October.

Egg of *B. ovatus*. Length 2.2 mm. Width 1.7 mm. Flat, oval, rounded at both ends. Side resting against leaf flat. Upper surface slightly convex. Chorion apparently smooth, shining. Transparent when first laid, later becoming yellowish white. Just before hatching larva can be seen through the transparent chorion, resting with the abdomen bent back sidewise upon itself the tip touching the second thoracic segment. Except for its smaller size, (Length 1.7 mm., width 1.1 mm.,) the egg of *B. aerosus* appears to be similar to that of *ovatus*.

In depositing the egg, the female protrudes the tip of the vagina slightly and rubs it back and forth against the leaf surface. This operation which ends in three or four minutes results in an oval, flat, transparent, watery-like mass, the outer surface of which soon hardens into a thin film or skin. The entire thing resembles an oval drop of transparent, watery excrement rather than an egg.

Of a pair of *B. ovatus* collected May 27 and placed in a cage, the female deposited sixteen eggs. A pair of *B. aerosus* collected at the same time and caged resulted in the female depositing forty-five eggs. Another pair of *aerosus* yielded thirty-five eggs. Inasmuch as no eggs were noted in the field when the specimens were collected, these numbers may be fairly representative. All of the above specimens lived and fed for six weeks, the eggs being deposited during the first four. All eggs were deposited on the upper leaf surface, many of them close to the edges. As a rule, leaves uninjured by adult feeding were selected. The young larva usually enters the leaf tissue directly beneath the egg and mines

either in an irregular area around the egg or in a gradually widening, elongate area away from the egg and parallel to and against the leaf edge.

Practically all of the *ovatus* eggs in our cages and many in the field were parasitized by *Closterocerus cinctipennis* Ash. In the cage containing forty-five *aerosus* eggs, nineteen mines were started, 17 eggs were parasitized and nine appeared to dry up. In the cage containing thirty-five *aerosus* eggs, ten mines were started, fifteen eggs were parasitized, and ten failed to hatch for some reason or another. Most of the larvæ which started the mines were also parasitized by the same species. Parasitized eggs became black in colour and many such were noted in the field. A few good eggs were noted as late as July 15, showing that egg deposition evidently extends over a considerable period.

Full grown larva of *B. ovatus*. Length 7 to 9 mm. Width of first thoracic segment 2.4 to 2.85 mm. Slightly wedge-shaped, much flattened. Body composed of thirteen well-defined segments which are deeply notched and lobed. Head and mouth-parts dark. Head more or less retracted into first segment. First segment as broad or slightly broader than the following, body gradually tapering to the twelfth segment. First segment with large, well-developed, comparatively smooth, shining, subquadrate plate on both dorsal and ventral surfaces. Dorsal plate with median line groove. Abdominal segments one to seven with pronounced rounded lobes. Lobes of abdominal segments five to nine each bearing a group of several stout, minute spines. Posterior dorsal edge of eighth abdominal segment fringed with row of minute, stout spines. Colour whitish, broad median dorsal line indicated on abdominal segments one to eight. Lateral dorsal portion of each body segment except the first varies from light gray in some specimens to black in others. (Immature specimens are entirely whitish). Entire dorsal surface except plate of first segment covered with somewhat slightly raised dots. These are more apparent laterally and bear the dark colour. Ventral surface somewhat similar to dorsal. Entire lateral surface of body sparsely hairy.

The larva of *B. aerosus* appears to be somewhat similar to the above, except that it is smaller (Length 4–5 mm. Width of first segment 1.53 mm.), and that the sides of the body appear to be slightly rougher, and the spines on the lobes of the fifth to ninth abdominal segments appear to be less pronounced.

Pupa of *B. ovatus*. Length 6.7 mm. Greatest width 3.5 mm. Colour brown ochre (Nomenclature of Windsor & Newton's Water Colours). Shape similar to that of the adult. Surface smooth, shining.

This stage is probably passed on top of the soil in rubbish or under the surface of the soil. Many mines were examined in the field, but no pupæ were ever found. It was noted that in every case, the larva had made its exit through the lower surface of the mine. In our cages only one larva of *ovatus* pupated, and it did so on the surface of the soil. When full grown they left the mines, and for some reason or another all except one died on the surface.

*Ovatus* was described by Weber in 1801 (Observ. Ent., Vol .1), and *aerosus* by Melsheimer in 1846 (Proc. Acad. Nat. Sc. Phila., Vol. 2). There is some synonymy indicated, but this need not be gone into here.

OAK LEAF SHOWING INCOMPLETE MINE OF *BRACHYS OVATUS*.

The dark oval spot near the lower edge of the mine is the dried egg shell.

# NOTES ON THE NORTH AMERICAN SPECIES OF CORIZUS. (COREIDÆ, HETEROPTERA).

BY EDMUND H. GIBSON, U. S. BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

After several months of studying long series of specimens representing each species that occurs in North America and many exotic species the author comes to the conclusion that no satisfactory results, as to the limits of each species, the systematic arrangement and relation of species, can be obtained from the mere examination of dried adult specimens, especially without an increased biological knowledge of the group. The writer, therefore, is forced to call tentative any remarks or deductions herein set forth until they are verified by results obtained from life-history and habit studies of each species. At the outset of the study it was the plan to revise the genus, but being forced to abandon this because of the above stated reasons, this paper resolves itself into more or less of a review of Hambleton's* treatise of the North American species, which has been the most notable contribution to our knowledge of the group.

In the first place attention must be called to the great similarity of this genus to the Lygæid genus *Nysius* Dall., which has often been a stumbling block for young students and general collectors. In the mind of the author *Corizus* represents a much degraded group of Lygæidæ and should be considered in that family rather than the nucleus of a subfamily of Coreidæ, or else it is the group that links Coreidæ with Lygæidæ and is sufficiently different from both to be considered the basis of a separate family (Corizidæ L. & S.) The chief point of difference between *Corizus* and *Nysius* lies in the character and form of the genitalia of both sexes. Also *Corizus* may be distinguished from *Nysius* by the lack of a prominent osteolar canal and simplified odoriferous orifice and in the much more produced scutellum.

From all evidence at hand I agree with several other hemipterologists that subgenera should not be recognized and hence the names *Liorhyrsus* Stal., *Stictopleurus* Stal., and *Niesthrea* Spin. go into synonymy with *Corizus*.

The following artificial key is offered as an aid to the identification of the species with the hope that numerous dubious points in Hambleton's key will be cleared up.

## Key to the Species.

1. Antenniferous tubercles very long, approximating the length of the first antennal segment.....*tuberculatus* Hambl.
   Antenniferous tubercles more or less prominent, but not long or approximating the length of the first antennal segment.....2
2. Posterior border of metapleura not prominently expanded laterally, lateral posterior angles broadly rounding and receding from margin of abdomen.....3
   Posterior border of metapleura more or less expanded laterally, lateral posterior angles usually acute, sometimes rounding but never receding from margin of abdomen.....4
3. Species large, connexivum spotted.....*crassicornis* Linn.
   Species small, connexivum unspotted.....*viridicatus* Uhl.

*The Genus Corizus with a review of the North and Middle American Species. J. C. Hambleton, Annals Ent. Soc. Am., Vol. 1, No. 1, pp. 133-152, 1908

4. Last segment of abdomen short, truncate in female and evenly rounded in male as viewed from above..... *hyalinus* Fabr.
   Last segment of abdomen comparatively long, rounded or pointed in female, not evenly rounded in male as viewed from above.....5
5. Scutellum broad at apex, rounded or blunt.....6
   Scutellum narrow at apex, pointed.....11
6. Abdomen above distinctly marked transversely with black, second and sixth segments light coloured.....*sidæ* Fabr.
   Abdomen not so marked.....7
7. Last dorsal abdominal segment of female long and distinctly angulate, apex less than a right angle. Dark coloured species. Sternum black, connexivum of male spotted.....8
   Last dorsal abdominal segment of female rounding, apex greater than a right angle.....9
8. Female segment very acutely pointed, extremely long. Western species.....*punctatus* Sign.
   Female segment not acutely pointed, Eastern species.....*bohemanii* Sign.
9. Species small, robust, and dark coloured, mottled on underside of abdomen. Very hairy. Connexivum heavily marked.....*parvicornis* Sign.
   Species larger, generally lighter coloured, not so hairy. Underside of abdomen not mottled. Connexivum only slightly marked if at all....10
10. Species medium sized to small.....*lateralis* Say
    Species much larger.....*lateralis* var. *validus* Uhl.
11. Postero-lateral angle of metapleura greatly produced. Antennæ short, last joint comparatively stout. Wings not extending to end of abdomen. Species small and robust. Densely clothed with fine long hairs.....*hirtus* Bueno
    Not as above.....12
12. Sternum black. Small species.....*indentatus* Hambl.
    Sternum not black. Larger species.....*scutatus* Stal.

*C. hyalinus* Fabr. is a well-defined species and readily distinguished from all others by the shape of the last abdominal segment in both sexes. It is cosmopolitan in its distribution, and is the logotype of the genus. I am unable to separate by structural characters the various varieties as listed in Van Duzee's catalogue.

*C. tuberculatus* Hambl. should not be confused with any other species. The very greatly produced antenniferous tubercules serve to distinguish it. In general appearance it greatly resembles *indentatus* Hambl., *punctatua* Sign., and *bohemanii* Sign. This is a western species, records show it occurs from Washington and Idaho south through Oregon, Nevada and California.

*C. hirtus* Bueno is the smallest species in the genus, and appears to be somewhat of a degenerate form of *parvicornis* Sign. The elytra are usually much shortened and appear undeveloped. It is probably limited in its distribution to the northeast.

*C. parvicornis* Sign. But little needs to be remarked concerning this species, its short, stout, form being quite characteristic. It is known to occur in Washington, California, Arizona, New Mexico, Texas, and southward.

*C. punctatus* Sign. The greatly produced and acutely pointed last abdominal segment of the female serves as a character to set this off from other species. However, in this respect the females of *bohemanii* Sign. approach *punctatus*, and I am unable to separate the males of these two species. *C. punctatus* is limited to the southwest, while *bohemanii* occurs over the entire eastern half of the United States. While for the time being it is wise to keep these two forms distinct and as separate species, yet the author surmises that one may be a locality form of the other, and at some future time with increased evidence it may be best to consider one a variety of the other.

*C. bohemanii* Sign. is probably the most common species found in the East and Central States. Typical specimens are extremely dark in colour. The last abdominal segment of the female is produced more than any other species except *punctatus* Sign.

*C. scutatus* Stal. is the largest species in North America, and occurs from British Columbia south into Mexico. Its generally large size and bluntly pointed scutellum will serve to distinguish the species. In colour it varies considerably. Typical specimens are dark with connexivum heavily marked.

*C. indentatus* Hambl. is a comparatively small form that can only be separated from *scutatus* Stal. by its size and the fact that its sternum is black while that of *scutatus* is normally light-coloured. Both are western species.

*C. sidæ* Fabr. is very variable in size and general colour, but is readily separable from the other species by dorsal transverse, black bands or markings on the third, fourth and fifth abdominal segments. This characteristic colour marking is always present, although in some specimens examined it has become less prominent or faded. Numerous specimens exhibit much reddish coloration. Some authors would undoubtedly establish numerous varieties based upon variations of colour and size, but the writer is prone to believe that such differences come from climatic and food conditions. A close study of the external anatomy of these so-called forms reveals no structural differences. I do not agree to the advisability of considering *pictipes* Stal. a distinct variety. It is also a cosmopolitan species.

*C. lateralis* Say occurs over the entire United States and southward. There are no outstanding features that will readily serve to separate this from other species. The process of elimination in the determination of species will apply to advantage. If specimens in question cannot be placed in other species they are usually called *lateralis*. The acutely pointed scutellum and lack of markings on the connexivum are generally used as diagnostic characters. It is very variable in size and colour, some specimens being quite dark or reddish and others entirely pale yellow. I am unable to separate Uhler's *validus* from *lateralis*, except in size and the slight colour markings on the connexivum. However, I have seen innumerable gradations in size from an extra large, so-called *validus* to a minute *lateralis*, and have been unable to separate them by structural differences. Also even some nearly typical *lateralis* will exhibit slight indications of colour markings on the connexivum. For the time being I consider it advisable to consider *validus* as a variety of *lateralis* until more biological evidence is at hand.

*C. crassicornis* Linn. and *viridicatus* Uhl. These two species form a group quite distinct from all other species, and can be most easily recognized by the

fact that the posterior margin of the metapleura is nearly truncate, being only slightly sinuate. The posterior lateral angles of the metapleura are broadly rounded in these two forms, while in the other species they are more or less produced and not receding from the lateral margin of the abdomen. There are other characters, such as the transverse suture of the pronotum ending in a loop, which Hambleton gives for separating these species, but the author considers the difference in structure of the metapleura to be of the most importance. *C. viridicatus* is smaller and lighter coloured than *crassicornis*, and does not have the range of distribution that the latter has. With further biological data the writer suspicions that *viridicatus* will have to be considered a variety of *crassicornis*, or may even be forced into synonymy with the latter.

*C. crassicornis* occurs over the entire northern portion of the United States, and in the west it is known to extend north into Canada and south into Mexico, It also occurs in Europe and Asia. *Viridicatus* has been recorded only from Iowa, Nebraska, Wyoming, Utah, Nevada, Colorado and New Mexico.

The writer disagrees with Hambleton's opinion that "the nature of the dorsal sutures between the third and fourth, and fourth and fifth segments of the abdomen is quite constant." The advisability of using this character in the separation of species is certainly risky. The characters of the genitalia should only be used in the separation of but few species.

For a full description and complete bibliography of each species reference should be made to Hambleton's paper and to Van Duzee's recently published and most excellent catalogue.

In closing the writer wishes to acknowledge the generous loan of specimens from Messrs. H. G. Barber, J. R. Bueno, C. J. Drake, R. W. Leiby, W. L. McAtee, and Rev. M. Wirtner, all of which greatly facilitated the study which in turn permits these preliminary remarks. These collections with that of the National Museum afforded long series in each species.

## A NEW RACE OF *PLEBEIUS ICARIOIDES* FROM VANCOUVER ISLAND.

BY WM. BARNES, M.D., AND J. McDUNNOUGH, PH.D., DECATUR, ILL.

This variable species seems to have developed on the southern portion of Vancouver Island into a local and very characteristic race which, on the underside, has so much similarity to *pheres* Bdv. from the San Francisco region that it has frequently passed under this name, and is probably figured by Holland in his Butterfly Book (Pl. XXX, Fig. 37) as this species.

The most characteristic feature of this new race, however, is found in the colour of the blue scaling of the upper side; this is a distinct silvery-blue, much as in *saepiolus*, and easily distinguished from the violet or lilac-blue of the other *icarioides* races; we have at various times had single specimens before us for examination, but this year through the efforts of Mr. E. H. Blackmore, of Victoria, B.C., we have secured a fine and, in general, very constant series of both sexes; we take much pleasure in dedicating this interesting form to its discoverer, and describe it in detail as follows:—

**P. incarioides blackmorei** *var. nov.*

♂. Upper side brilliant silvery-blue; primaries with a blackish border, 2 mm. broad, along outer margin; secondaries with vague dark marginal spots,

surrounding which the blue is of a somewhat paler colour than on the remainder of the wing; a small patch without blue scaling at costal angle; terminal dark line; fringes on both wings with basal half blackish and outer portion white, except along abdominal margin of secondaries where they are totally white. Beneath both wings pale gray, sprinkled with greenish at base and suffused with whitish rather broadly along outer margin; primaries with the dark discal dash and postmedian row of spots reduced in size as compared with those of typical *icarioides* (Sierra Nevada region) but broadly encircled with white; subterminal spots obsolete; secondaries with a white lunate discal mark and a curved postmedian row of rather obscure white spots, very faintly centered with black dots; traces of faint whitish subterminal lunules; fringes white.

♀. Upper side deep black-brown, basal half of primaries scaled with blue; a narrow, black discal mark; secondaries bluish at base and along abdominal margin; a narrow, broken, bluish line along outer margin, behind which are traces of dark spots similar to those of the ♂, partially outlined by blue scaling; no red scaling. Underside very similar to that of the ♂, with slightly darker ground colour. Expanse, ♂ and ♀, 30 mm.

*Holotype.*—1 ♂, Goldstream, Vanc. Is., B.C., (May 31). Coll. Barnes.

*Allotype.*—1 ♀, Goldstream, Vanc. Is., B.C., (May 31). Coll. Barnes.

*Paratypes.*—7 ♂'s, 5 ♀'s (same locality and date) in Coll. Barnes, and 7 ♂'s, 5 ♀'s in Coll. E. H. Blackmore, Victoria, B.C.

In the ♂ sex the variation of the upperside is inconsiderable, consisting in the greater or less width of the dark border of primaries and the degree of distinctness of the marginal spots of secondaries which may either become more or less suffused to form a complete border or be almost completely covered by the blue scaling; occasionally a black discal lunule is present on the primaries. In the ♀ the discal lunule is at times entirely silvered, approaching in this respect *pheres;* other specimens show a more or less complete row of subterminal bluish lunules on secondaries; in none of our specimens is there anything but the very faintest traces of the red submarginal shading so often seen in typical *icarioides.* Mr. Blackmore writes us that the food plant of the larva is *Lupinus columbianus* Heller, and that the race is localized to a small hill, 700 feet high, about three miles south of Goldstream.

## ADDITION TO THE ODONATA OF FRANCONIA REGION, N.H.

In the Canadian Entomologist for January, 1919, (Vol. LI, 9–15) I published a list of the Odonata of the Franconia Region. Mrs. Slosson had been good enough to send me her complete list of Odonata collected at Franconia a decade or more ago, and her annotations were included in this paper save for the addition of three species inadvertently omitted by the printer. These bring the list to seventy-five species:

73. *Ophiogomphus rupinsulensis* (Walsh).
74. *Gomphus abbreviatus* Hagen.
75. *Tetragoneuria spinigera* Selys.

Mr. L. B. Woodruff has since the publication of the list sent me also a record of *Somatochlora elongata* (Scudd.) from Bretton Woods.

R. HEBER HOWE, JR.

Thoreau Museum of Natural History, Concord, Massachusetts.

April, 1919

## A NEW JAPANESE SPECIES OF THE CYRTID GENUS OPSEBIUS.

BY F. R. COLE, BUREAU OF ENTOMOLOGY, FOREST GROVE, ORE.

In a collection of Cyrtidæ kindly loaned for study by the Entomology Department of Cornell University I found one specimen which was collected at Harima, Japan. The specimen belongs to the genus *Opsebius* and is an undescribed species. As far as I know this is the first Cyrtid recorded from Japan.

The genus *Opsebius* was described in 1856 by A. Costa from a species, *O. perspicillatus*, collected in Spain. In the following year Loew described *inflatus* from Spain, and not having seen Costa's paper erected for it the genus *Pithogaster*. In 1870 Loew described *O. pepo* from Spain, and in 1871 described *O. formosus* from the locality termed Gallia, probably southern France. The five other described species in the genus are all from the United States.

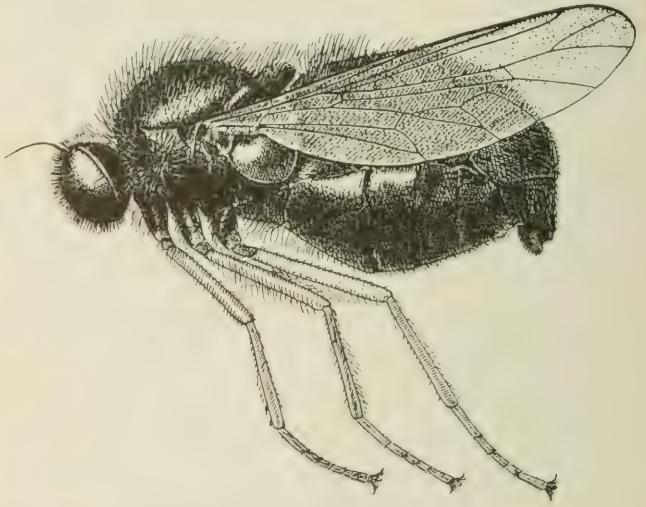

Fig. 13.—Opsebius nipponensis, n. sp.

The American species are uniformly blackish in body colour. In the three European species the body is black and yellow, and in the Japanese species described below the body colour is metallic green. All species of *Opsebius* have a characteristic cross-vein dividing the long cell above the discal. This cell may be an outer first basal or the first posterior. Loew left out this cross-vein in figuring the wing of *O. inflatus*, but Osten Sacken examined the type years afterward and found it to be present.

### Opsebius nipponensis, n. sp.

♀. Eyes black with a purplish tinge. Head viewed from in front almost round. Eyes with long, dense black pile. Antennæ black with the long bristle-like arista characteristic of the genus. Occiput metallic green with long yellowish pile.

Thorax and scutellum metallic green with long, almost erect, yellowish pile. Ptero- and metapleuræ a bluish green, the upper pleuræ with yellowish pile. Squame semi-transparent and coloured a peculiar shade of brown, the rims yellowish.

Abdomen bronze green and clothed with a yellowish pile which is reclinate on the last four segments and thicker on the dorsum near the posterior margins of the segments. The abdomen is swollen in appearance and much larger than the thorax (broken at the base in this specimen). Venter much the same colour as the dorsum. Genitalia yellowish brown.

Legs honey yellow, the claws black. Wing membrane infuscated, darker toward the base. Veins blackish. Venation near the North American *O. diligens* O. S. Besides the characteristic outer cross-vein in the cell above the discal, there is a supernumerary cross-vein in one wing of this specimen just inside this vein. Length 8.5 mm.

*Habitat.*—One specimen collected at Harima, Japan, on May 19, 1916. The type is in the Cornell University collection.

## A NEW SPECIES OF HYLEMYIA FROM CANADA (DIPTERA, ANTHOMYIIDÆ).

BY J. R. MALLOCH, F.E.S., URBANA, ILL.

The species described in this paper belongs to the genus Hylemyia, subgenus Pogonomyza S. and D. There are three other North American species of the subgenus known to the writer, all of which occur in the northeastern United States. The type specimen of the species described in this paper is in the Canadian National Collection of Insects, at Ottawa.

**Hylemyia (Pogonomyza) spinosissima,** sp. n.

Male.—Black, distinctly shining, entire body with rather dense, brownish gray pruinescence. Orbits, face, and cheeks with white, almost silvery, pruinescence; second antennal joint reddish yellow at apex. Thorax indistinctly vittate. Abdomen with a poorly defined dorso-central black vitta. Wing yellowish, veins pale. Calyptra and halteres yellow.

Head small; eyes separated by a little more than width of anterior ocellus; orbits sparsely bristled on almost their entire length; arista with dense, very short hairs; parafacial much narrower than third antennal joint; cheek not twice as high as width of parafacial; proboscis as thick as fore femur. Presutural acrostichals weak, 2-rowed; prealar bristle about one-third as long as the bristle behind it; sternopleurals 1:2 or 1:3; scutellum bare below. Abdomen narrow, parallel-sided, all dorsal segments with long, strong bristles on posterior margins and in a transverse series on disc; hypopygium of moderate size; fifth sternite with very short hairs. Fore tibia with from 2 to 4 bristles on antero-dorsal and on posterior surfaces; mid femur not much swollen, with a series of short bristles on entire antero-ventral surface, and 4 exclusively long, strong bristles on postero-ventral surface, the one furthest from base directed slightly apicad, situated at middle; mid tibia with 1 antero-dorsal, and 4 irregularly placed posterior bristles; hind femur with a series of bristles on antero-ventral surface, and another, weaker, series on basal half of postero-ventral surface; hind tibia with 4 or 5 strong antero-dorsal and 3 strong postero-dorsal bristles, the antero-ventral and posterior surfaces each with some setulose hairs. Costal thorn small; last sections of veins 3 and 4 subparallel.

Length 5.25 mm.

Type.—Port Hope, Ont., June 13, 1897, (W. Metcalfe).

This species is separable from its allies by the bristling of the mid femur, the postero-ventral bristles being much longer than in any of the other species, the longest at least twice as long as the femoral diameter.

## A NEW SPECIES OF CŒNOSIA FROM CANADA (DIPTERA, ANTHOMYIIDÆ).

BY J. R. MALLOCH, F.E.S., URBANA, ILL.

The species described in this paper is one which was submitted for identification by the Dominion Entomologist. The type specimen is deposited in the National Collection of Insects, Department of Agriculture, Ottawa.

**Cœnosia fuscifrons,** sp. n.

Male.—Black, covered with dense white pruinescence. Head black, with white pruinescence except on interfrontalia; antennæ and palpi black; proboscis brown. Thorax and abdomen unmarked, apices of abdominal segments yellowish. Legs pale yellow, gradually darkened from near base of femora apicad, the tibiæ and tarsi usually fuscous, sometimes the bases of tibiæ pale. Wings white at bases, distinctly browned beyond to apices. Calyptra white. Halteres yellow.

Frons nearly twice as long as broad; orbits narrow, well defined, the bristles long, upper pair shorter than second and ocellars; antennæ reaching over two-thirds of the distance to mouth-margin, third joint slightly angulate at apex above; arista bare; parafacial in profile almost linear; cheek higher than width of third antennal joint, the margin with a few long, slender bristles. Humeral angle with one long and four or five short, stout bristles; presutural acrostichals in an irregular single or double series; intra-alar bristles weak; lower stigmatal bristle weak or absent, when present directed laterad or slightly upward. Abdomen short, cylindrical, dorsum with a few scattered setulose hairs; hypopygium small, retracted; fifth sternite with a large V-shaped excision, the processes short and broad. Legs long and slender, the bristles hair-like; basal joint of tarsi on all legs at least half as long as tibiæ; fore tibia with one median posterior bristle; mid tibia with the two median bristles very short, situated at about the same distance from base; hind tibia with the antero-ventral bristle very weak and short, the antero-dorsal and preapical dorsal bristles each over one-third as long as tibia. Inner cross-vein of wing below apex of first vein; third vein ending in apex of wing; apex of fourth basad of apex of third.

Length 2.25 mm.

Type.—Brockville, Ont., August 12, 1903, (W. Metcalfe). Paratypes, Ottawa, August 17, 1907, (J. Fletcher); Port Hope, Ont., May 14, 1897, (W. Metcalfe).

This species most closely resembles *argentate* Coquillett of the North American fauna, but may readily be separated from that species by the narrower frons and the colour of same, which is fuscous instead of silvery.

Mailed April 28th, 1919.

The Canadian Entomologist

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# POPULAR AND PRACTICAL ENTOMOLOGY.

## Fragments in the Life-habits of Manitoba Insects.

by norman criddle, dominion entomological laboratory, treesbank, man.

Field work such as is carried on by the staff at an entomological laboratory naturally presents many opportunities for insect studies apart from the major problems for which the laboratories were primarily established. Thus the odd hours when more important matters are temporarily absent, or the less frequent occasions provided by the stops between trains, present opportunities for numerous minor studies resulting in the accumulation of various more or less disjointed notes which under ordinary circumstances remain unpublished. As such notes might well prove of interest to others, I have taken advantage of the Editor's request for an article to bring a few of them together under the above heading.

### Pœcilopsis (Apochiema) rachelæ Hlst.

This moth has usually been considered rare but in reality is probably more numerous than is generally supposed. It appears quite early in the spring at the time when the first willows are flowering, though I have never observed it actually resting upon the flowers. It becomes active at the time when the beauties of sunset are darkening into twilight, and for that reason we christened it "the Twilight Moth." At that time the male moths may be seen flying in a jerky, up and down flight not unlike that of the buck moth (*Hemileuca*) and if we watch carefully, the hovering of the male over a certain spot will occasionally reveal the wingless female. The latter, however, is very difficult to find, and more often than not its discovery is due to accident rather than to search. The females have been found resting upon the ground, on the trunks of trees, or on the smaller twigs of shrubs such as willows. Aspen poplar appear to harbour them most frequently, possibly because the moth shows a wonderful colour resemblance to the bark. Willows, too, are often chosen for resting places, and here again the little bundle of fluff, of which the female moth reminds one, is very like a pussy willow.

The life-history of *Apochiema rachelæ* was described in the Canadian Entomologist by Mr. Arthur Gibson, Vol. XLV, No. 12, 1913, but the egg-laying habits, of which the strange ovipositor had occasioned considerable speculation, remained in some doubt at the time, and the observations which eventually filled the gaps have remained unpublished since 1915. In that year a female *Apochiema* was found running actively along the ground in broad daylight on April 13, having probably been disturbed by the building operations taking place close at hand. She was placed in a cage in which a goodly number of twigs, rotten wood, sods and other objects were added for ovipositing purposes. During the day time she remained quiet, but as the shades of evening approached she became active and was used to lure males within reach. Later it became evident that she was seeking a suitable situation for her eggs, and as she showed

little concern for the dimmed light of a lantern, I was able to watch her movements without in any way interfering with her work. Thus, she was seen to run actively about the cage, climb up and around the various twigs, and when a promising crack appeared test its possibilities with her ovipositor. Eventually reaching a dead twig containing loose bark she became greatly excited, and before long had thrust her ovipositor behind the bark between a crack and deposited an egg upon the wood beneath. Then moving to another spot she repeated the performance. Many of her efforts to reach a favourable situation were, however, without avail, and while she seemed to object strongly to placing more than one egg in the same place, the scarcity of appropriate cracks elsewhere invariably induced her to return to the original twig. It thus happened that while she searched over every object in the cage with great care her entire clutch of eggs was ultimately placed in the one twig. In all about 40 eggs were deposited. These, as was to be expected, were somewhat bunched though no egg actually rested upon another, and all were well hidden by the overhanging bark.

The foregoing observations provide strong evidence to show that the eggs of *Poecilopsis rachelæ* are not laid in masses as was previously supposed, but instead are deposited singly or at most in small numbers. They are placed beneath the dead loose bark, probably on those twigs so commonly found attached to the lower stems of aspen poplars or upon willows which provide many similar conditions.

This will, of course, explain why the larvæ are generally found singly and have a diversity of food plants. It also accounts for the remarkable agility of the female moth and the activity of the young caterpillars.

Eggs from the above-mentioned moth hatched on May 10–11, and moths from the resulting pupæ on April 20 of the following year. A majority of the adults were, as usual, females.

**Leucobrephos brephoides** Wlk.

The remarkable earliness at which this moth makes its appearance in springtime has often occasioned speculation as to whether or not it was able to force its way through the snow. The adults have frequently been observed flying and were captured too, while the woodlands still rested under a thick covering of snow and only the extreme uplands were free from its mantle. This seemed strong circumstantial evidence in favour of the supposition that the moths did make their way, though the small amount of visible land always left a doubt as to whether this was actually so or not. In 1916, however, evidence of a direct nature became available, which left no doubt as to the moth's habits in this respect.

The spring of 1916 was an unusually late one in Manitoba, while the winter preceding it had provided an abnormal amount of snow. Thus up to April 10 no land was visible anywhere, and the woodlands among which *L. brephoides* is known to breed presented a solid covering of approximately two feet in depth. Odd thaws had occurred, however, and once the temperature rose to 44° F. in the shade, so that the snow was actually in a thawing condition. The first moths were seen flying on April 1, and during the succeeding days were observed frequently up to the 10th, some of which we captured. As a rule these moths were noted resting upon bunches of straw, hay or some other material dropped

along the trails, and it was only on the warmer days that they appeared on the snow itself. One of these latter captures, however, presented unmistakable evidence of having recently emerged as it had not yet reached the state when active flight was possible, the wings being soft and not fully developed. It has been suggested that the larvæ of this moth might pupate in the dead, partly rotten wood as *Brephos infans* is supposed to do, and so perhaps lie above the snow line. Breeding experiments have failed, however, to show any indication of this. Moreover, the open woods in which *L. brephoides* breeds were in the above instance practically free from necessary dead material. Perhaps not the least interesting point in this moth's habits is the fact that it emerges when the temperature registers but a few degrees above freezing and while the ground upon which the pupæ rest must be very close to the freezing point. The moth, however, is thickly clothed with hairs which doubtless help to protect it from the cold.

**Hemileuca lucina** var. **latifascia** B. and McD.

This moth is by no means uncommon in the sand dunes near Aweme, Man. The handsome black and yellow caterpillars are at first found in bunches feeding upon the low shrubby aspen poplars and later as they attain maturity, scattered singly upon the same type of vegetation. They are often heavily parasitized and, in consequence, the moths only appear in large numbers at intervals of several years. The moth is an unusually handsome one, and its jerky, up and down flight, from whence it gets the name "buck moth," makes it an object of particular interest, flying as it does in broad daylight and during the finer days of autumn. For a long time we found difficulty in securing them. Then in a moment a secret was revealed to us whereby the males were collected with little effort. The moth is, of course, a day flier so that light traps are out of the question; yet, strange as it may seem, fire still provided the attractant, though in a totally different way. The means adopted to obtain the desired end were extremely simple and consisted of lighting a small fire from which sufficient smoke issued to drift "down wind" for about half a mile; in other words, to make a smudge of some dead grass and leaves. Then the collectors would calmly sit near and await the coming of the moths, nor were the latter long in appearing. A moth would be seen dodging backwards and forwards across the smoke as if seeking the strongest part of it, but at the same time steadily moving nearer to its source. Soon it was hovering over the fire and shortly after found a resting place in a convenient cyanide bottle. Others quickly followed, perhaps two or three at once, and the sport became fast and exciting. From what distance these moths came is unknown, but doubtless it was from as far as the smoke remained fresh. A bright, sunny day with a breeze sufficient to keep the smoke low provided the ideal conditions. We noted that these moths came towards the fire without hesitation, and that they invariably flew towards its source as if recognizing at once from whence it came. When actually over the fire they hesitated, hovered over it, and at times flew directly into the flames; on other occasions they recognized the heat sufficiently soon to enable them to "make off" before being injured.

From the fact that only males were enticed it would seem as if the smoke provided some odour or other attracting properties reminding the male of the opposite sex rather than of food. But whether this is so or not cannot

be definitely settled at the moment. The habit, however, provides an instance of how the males of this moth might be destroyed in large numbers were they ever to become a pest. Unfortunately the females are not attracted in this way, and it is on them after all that the perpetuation of the species depends most.

My brothers and I have since attempted to lure other insects by similar methods, but our efforts for a long time were without avail; indeed, so far as one could judge, most insects had a decided objection to the smoke. Later, however, we found that we had been actually associated with another insect that came persistently though doubtless from a very different motive from the *Hemileuca*. An account of this is given under the next heading.

### **Musca domestica** Linn.

The common house-fly needs no introduction and it has been dealt with so frequently, both scientifically and popularly, that one can hardly expect to add much to what has already been written.

Our first experience with the house-fly as attracted to camp-fires was many years ago. We thought then that it was the savoury smell of a roasting grouse that induced the gathering, and I am not prepared to say even now that this was not, in part, the case. Later, however, we discovered that the flies came almost, if not quite, as readily when no cooking was in progress. But the climax was reached when we attempted to drive the pest from a building by smoking it out and after being forced out ourselves and permitting the smudge to modify, found to our astonishment that the flies were thicker than ever inside as if waiting a promised feast. It seemed to matter little where the fire was started, be it in the wilds far removed from habitations or close around the farm yard, the smoke no sooner had time to spread than along came a house-fly and soon a small procession was seen rapidly beating "up wind." Unlike the moth described above the flies did not fly directly into the fire, but instead seemed to use the smoke merely as a guide that led to other objects more attractive. Further observations convinced us that smoke constituted an invariable attractant for these insects. We also noted that a frequent method of entering a house, namely, by means of a chimney was only utilized when a fire provided the necessary smoke, and not to any noticeable extent when heat alone issued forth. Thus the contention that the attraction was in reality heat and not smoke, does not seem to be warranted from this evidence, and while the gathering of flies around screen doors and windows is doubtless, in part, due to warmth it may also be largely influenced by the smells from within, including smoke. Our experiments in the field, in which we provided a maximum quantity of smoke with a minimum amount of heat, in every way confirmed our previous observations as to smoke being the true cause of the attraction. It might be asked why should flies be drawn to smoke and follow it to its source. What does smoke usually foretell? A habitation or camp fire and these in their turn, man and food. Is it not possible that this reasoning acquired from long association with mankind, has become part of the fly's instinctive nature? It seems so to me, but I am content to let others judge. In any case, there are opportunities for some interesting experiments along the lines of this study which would seem well worth while.

**Cicindela limbalis** var. **awemeana** Casey.

This insect, in its adult state, is usually found on semi-moist roads, on similar moist areas along river banks or on pocket gopher hills in openings among semi-wooded areas. In autumn it seeks rather higher situations in which to hibernate. The larvæ occur in much the same places as the beetles, but are more easily discovered on the old gopher mounds that have become firm through the combined action of snow, rain and time.

In 1916, I came across a single gopher hill on quite high ground in which were no less than 16 burrows, most of which contained almost mature larvæ. These were marked for further observation and on August 8th dug up. The result showed 11 beetles about to emerge, 5 empty holes from which adults had issued, several parasite cocoons and a dead larva from which were coming numerous minute hymenopterous insects which were secured. These latter were afterwards determined by Mr. Girault, through the courtesy of Dr. Howard, as *Tetrastichus microrhopala* Ashm. There was also one living larva which would undoubtedly winter over and become a beetle the following year. Pupal cells were always either in, or very close to, the larval burrow and the average length of the two combined was three inches, while the deepest slightly exceeded four inches, and the shallowest two inches. The single larva had a burrow measuring four and a half inches, which represented the height of the gopher hill. This seems to be the usual depth even in winter time, as the larvæ, apparently, are unable to dig through the sod found below the mounds.

The beetles are also content with shallow winter burrows which seldom exceed a foot in depth.

**Eleodes tricostata** Say.

While investigating wireworms in grain fields during 1915, a new form of injury was noted which, in many respects, resembled the work of cutworms. This on close inspection, I traced to an active wireworm-like larva having indeed a close superficial resemblance to a true wireworm, but showing structural characters which placed it among the *Tenebrionidæ*. Specimens collected were about an inch in length, shiny, brownish-slate in colour above, with a blackish head, a light undersurface and a dark stripe along the ventral side. Pupation took place about August 18 and adults emerged the second week in September.

The habits of these *Eleodes* larvæ closely resemble those of ordinary cutworms, *Euxoa* spp. They appear above the ground at night, run actively about until they locate a suitable plant for food purposes, and then usually devour the leaves above ground, but at times, cut the stem off close to the surface. Their method of attack is generally told from that of cutworms by the plant being eaten above ground instead of being partly dragged under and eaten from below. The larvæ are very general feeders. In a wheat field they preferred lamb's quarters but ate wheat plants readily also. In captivity they feed upon various plants including red-root, pigweed, lambs' quarters, Russian thistle, tumble weed, Russian pigweed, wild buckwheat, hares-ear mustard, tumbling mustard, cabbage, turnip, beets, wheat, oats, barley and rye. It is also noteworthy that bran was consumed readily. Hence, there is reason to expect that the usual poisoned baits as used for cutworms would prove equally efficient in the control of this insect.

## NOTES ON THE GENUS *OLENE* WITH DESCRIPTION OF A NEW SPECIES.

BY WM. BARNES, M.D., AND J. McDUNNOUGH, PH. D., DECATUR, ILL.

In our Contributions, Vol. IV, No. 2, p. 129, we called attention to two distinct species of *Olene* larva found in Maine; the one we identified as that of *vagans* B. & McD. and the other as *willingi* B. & McD. This latter identification was, however, an unfortunate error on our part; at the time we had only the single ♂ type of *willingi* before us, a rather suffused, poorly marked specimen, but later Prof. Willing was kind enough to send us for examination the co-type and the larva from which the figure in our revision of the genus (1913, Contr. II, (2), Pl. V, fig. 5) was made. These proved conclusively that our identification of the Maine larva as *willingi* was incorrect and that our treatment in the revision should hold. From information received from Mr. T. Spalding, of Provo, Utah, concerning the larva of *grisea* B. & McD., we believe that this name also for the present must remain associated with *vagans* as the two larvæ agree in lacking the dorsal hair pencil on segment XI; in any case *grisea* cannot be associated with the Maine species which we wrongly called *willingi*, the larva of this being at once separable by the presence of the aforesaid dorsal hair-pencil.

Mr. W. H. Brittain, Provincial Entomologist of Nova Scotia, is about to publish a Bulletin on the life-history of *vagans* which obviates the necessity for any further remarks on our part concerning this species.

During the summer of 1918 Dr. McDunnough was fortunate enough to discover eight more larvæ of the second *Olene* species on oak and beech trees in the vicinity of Ottawa, Ont.; these agreed exactly with the specimen found feeding on hazel the previous summer in Maine and eventually hatched out into three ♂'s and five ♀'s; the ♂'s agreed well with the Maine specimen figured in our Contributions, Vol. IV, Pl. XX, fig. 7; the ♀'s proved to be identical with our ♀ type of *vagans*, a fact which we had already hinted at in our notes (l. c. p. 129) when restricting the type of *vagans* to the ♂ specimen. As the species is without a name we offer the following description based on our Ottawa material.

**Olene dorsipennata,** sp. nov.

♂.—Head, thorax and primaries rather even, dull, greenish gray; a straight black basal half-line; t. a. line broadly geminate, angled outwardly slightly in the cell, strongly in the fold and again immediately above inner margin, the included space partially filled with brownish shading; reniform of the usual broad lunate shape, incompletely outlined in black with traces of white shading within and around the edges, but much less prominently than is usually found in the group; t. p. line irregularly dentate, slightly bulging opposite the cell and strongly angled inwardly above inner margin, followed by a diffuse, dull liver-brown subterminal shade which in turn is bordered outwardly by a poorly defined whitish shade, most prominent as a small, white patch above anal angle; an irregular terminal black line slightly interior to the outer edge of wing, especially at anal angle; fringes greenish-gray, faintly checkered outwardly with pale ochreous. Secondaries dark smoky with faint traces of a darker subterminal line. Beneath smoky gray, darker in cell of primaries with large discal dot and diffuse subterminal line on all wings. Expanse 37 mm.

♀.—Similar in coloration to the ♂ but with the brown shading before the t. a. line and beyond the t. p. line more prominent; the reniform is contained in a distinct white patch and the black terminal line is bordered inwardly with white. Expanse 50–55 mm.

Holotype.—1 ♂, Chelsea, Ottawa Co., Que. (July 8–14.)

Allotype.—1 ♂, Chelsea, Ottawa Co., Que. (July 8–14.)

Paratypes.—1♂, 2 ♀'s from same locality, and 1 ♂, 2 ♀'s from Aylmer, Que.; all in Coll. Barnes.

We have already noted (l. c. p. 129) the points by which this species may be separated from the very similar *vagans*, but we must confess that, without a knowledge of the larva, in many cases a definite identification is practically impossible. There is considerable variation in the species, especially in the ♀'s; these tend to show an indistinctness of maculation, combined with a diffusion of the pale shades, which gives a general washed-out appearance to the specimens and is quite characteristic of the species. As regards the larva we have nothing to add to the description we published under the name of *willingi* (Contr. IV, (2), p. 130); we have taken the caterpillars on oak, beech and hazel and have found the empty cocoons on poplar so that the range of food-plants appears to be wide.

Of the *Olene* species feeding on deciduous trees we now definitely know the larvæ of *meridionalis*, *vagans*, *leucophœa*, *atomaria* and *dorsipennata*. Of these *meridionalis* and *vagans* are very similar and it may be, when the connecting link, *basiflava*, from the Southern New England States is known, that these three forms will be regarded as races of one species rather than as distinct species. It should not be hard for some of our New England collectors to settle this question as the larvæ are quite readily found by searching the trunks of trees in the day time; in most instances they are partially concealed in crevices of the bark. Beating in the early morning or at dusk is also productive of good results, especially in a neighborhood where the species has been definitely located.

The following table may be used as a means of separation:

Larva entirely ochreous.....*leucophœa*.
Larva gray or brown
With lateral black hair pencils anteriorly only.....*atomaria*.
With lateral black hair pencils anteriorly and posteriorly
With long dorsal black hair pencil on Segment XI....*dorsipennata*.
Without hair pencil on Segment XI.
Dorsal tuft on Segment XI broad, brown; many black, plumed hairs from lateral tubercles.....*meridionalis*.
Dorsal tuft on Segment XI narrow, blackish; only one or two black plumed hairs from each lateral tubercle.....*vagans*.

Concerning the pine-feeding Olenes Dr. McDunnough was successful in securing a number of the larvæ of *plagiata* by searching pine trunks in the vicinity of Ottawa the last week in May; they were then full grown, pupating in about a week and producing the adults in early June. Mr. J. M. Swaine, of the Entomological Branch, Ottawa, brought in two young larvæ of the same species in June, obtained by beating young pine trees in the vicinity of Ft. Coulonge on the Ottawa River; one of these fed up and produced the adult in August;

the other hibernated half-grown, and is at the time of writing commencing to feed again. It is evident that at least a certain proportion of the larvæ hibernate twice; in the case before us this took place in a slight web uniting two or three pine needles to form more or less of a protective covering; whether this is the natural method or whether the larva descends to the ground ordinarily is unknown to us.

*Plagiata* larva is gray with a decided yellowish tinge; the dorsal tufts on abdominal segments 1–4 and 8 are deeper mouse gray, intermingled with plumed white hairs; there are also lateral black hair pencils anteriorly and posteriorly as well as a single dorsal pencil arising out of the tuft on the 8th abdominal segment; the dorsal tubercles on the remaining segments show a rosette of short plumed white hairs and a number of longer slightly barbed yellowish hairs; the supra- and subspiracular rows of tubercles are very similar but contain in addition a single (occasionally two) long black plumed hair. Subventrally there is a fairly heavy clothing of long whitish, bipectinate hairs; the eversible dorsal glands are coral red.

Judging by the description given by Dr. Dyar of the larva of *pini* (1911 Proc. Ent. Soc. Wash., XIII, p. 19) the two must be very closely allied and may even be identical; however, as we have had no opportunity for a careful examination of either the larvæ or the adults of Dr. Dyar's species the two names may stand for the present as given in our Check List.

## KIRBY'S INSECTA: VOL. IV FAUNA BOREALI-AMERICANA. RESTRICTION OF AN INDEFINITE LOCALITY.

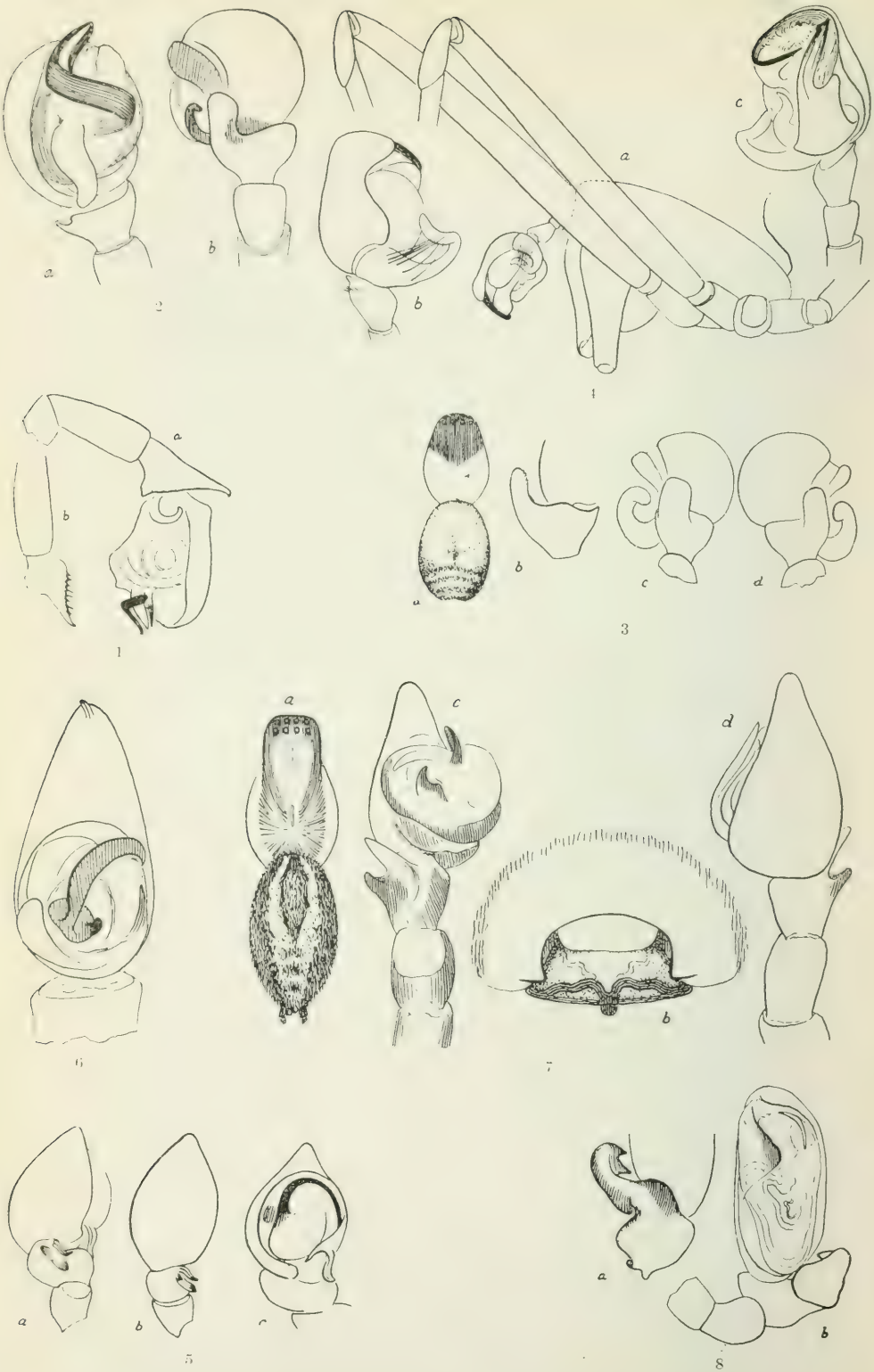
BY ALBERT F. WINN, WESTMOUNT, QUE.

Anyone who has occasion to consult this volume about Canadian Insects can hardly fail to notice the oft-recurring words "Taken in Canada by Dr. Bigsby," and will probably lay the book down wishing that the author had been more definite in quoting localities. While Canada in 1837 was of a very limited area compared with our country at the present day, it was of large extent.

Some months ago, having an enquiry as to what part of Canada, in my opinion, the types of a species of butterfly described in this volume probably came from, I tried to get a little light on the subject. The introduction to the work conveys nothing further than acknowledgement and thanks to Dr. Bigsby, of Newark, and Capt. Shepherd, of the Royal Artillery, for records for Canada, and to Dr. McCulloch and Capt. Hull for those of Nova Scotia.

In the Redpath Library of McGill University, however, there are three books by Dr. Bigsby. In one of these, entitled, "The Shoe and Canoe," by John (Jeremiah) Bigsby, D.D., late Secretary to the Boundary Commission, published in London 1831, I find the following: "Both my duty and my pleasure took me out of the common track————to Lakes Simcoe, Huron, Superior, etc., into a portion of Hudson's Bay and up the River Ottawa into Lake Nipissing as well as to the rarely visited Highlands of the St. Lawrence below Quebec."

It would seem safe to limit the locality "Canada" to the districts above mentioned, and wide though they still are, all are within the present boundaries of the Provinces of Quebec and Ontario.




SPIDERS FROM CANADA AND ADJOINING STATES.

## NEW SPIDERS FROM CANADA AND THE ADJOINING STATES, No. 2.

BY J. H. EMERTON, BOSTON, MASS.

The first paper of this series was published in August, 1917, and described a number of spiders from the Pacific coast, eastern Canada and northern New York and New England, part of them collected in the summer of 1916. The present paper describes a few new species collected and identified from the same parts of the country since 1916. In addition to the new species, the male of *Pardosa vancouveri*, described in the paper of 1917, has been found, and its palpus is now figured. *Diplostyla canadensis* Emerton, described in Trans. Conn. Acad., 1882, from Montreal, has been again found, at Lake Tear on Mt. Marcy in the Adirondacks, N.Y., at an elevation of 4,500 feet.

**Lophocarenum minakianum,** n. sp.

Hardly 2 mm. long. Light brown with the legs and palpi and underside of the abdomen pale. The whole upper half of the abdomen is thickened and covered with small depressions in which are minute hairs. The head of the male has a hump which carries the posterior middle eyes. It is about as high as wide, and rises abruptly before and behind. It is rounded on top and has a slight groove in the middle, but is not as deeply divided as in *L. sculptum* Em., (Can. Ent., Aug., 1917,) which this species closely resembles. At each side of the hump is a deep groove as in *sculptum* and *excavatum*. The male palpus is much like that of *sculptum*, but the process on the top of the tarsus is longer and more narrowly pointed. (Pl. 7, Fig. 1, a and b.)

Minaki, Ontario. Sifted from leaf mould near Minaki Inn.

**Ceratinopsis obscurus,** n. sp.

Male 2 mm. long. Legs and cephalothorax yellow brown and the abdomen dark grey. The cephalothorax is nearly as wide as long and narrowed in front. The male palpi resemble those of *C. nigripalpis*, but the outer process of the tibia is wide and flat. The tarsus has, as in *nigripalpis*, a wide, thick ridge on the outer edge, at the side of which is a narrower groove. The palpal organ resembles that of *nigripalpis* and *nigriceps*. (Pl. 7, Fig. 2, a, b.)

In leaf mould in pine and birch woods at Minaki, Ontario.

**Grammonata semipallida,** n. sp.

Scarcely 2 mm. long. Legs pale, cephalothorax but little narrowed in front, pale on the hinder half and darker gray in front. The palpi are also dark grey. The abdomen is gray, pale in front and marked behind with alternate dark and light transverse spots. (Pl. 7, Fig. 3, a.) The male palpi are large and the tarsus round. The tibia has a short, blunt process extending over the tarsus, which has a distinct groove in which the process fits. The tarsal hook is curved in a half circle. The tube of the palpal organ is slender and abruptly curved backward in the middle. (Pl. 7, Figs. 3, b, c, d.)

Winnipeg, Manitoba, June, 1917. F. W. Waugh.

**Diplostyla crosbyi,** n. sp.

Male 4 mm. long. First femur 3 mm. Height of head and mandibles nearly equal to length of cephalothorax. (Pl. 7, Fig. 4, a.) The cephalothorax and legs are brown and the abdomen gray with light markings in pairs, as in *nigrina*. The tarsus of the male palpus is but little longer than wide. The tarsal hook has a sharp angle near the end and the terminal part is thin and flat and curved.

as if to fit against the convex side of the palpal organ. Near the base of the tarsal hook are several long hairs. The basal process of the palpal organ is not as straight as in *nigrina*, but is turned a little inward, as in *inornata*, (Pl.7, Fig. 4, b, c) and the narrow terminal half is flattened and slightly grooved in the middle.

Sifted from moss at 3,500 feet near the mouth of Uphill Brook, near Mt. Marcy, in the Adirondacks, N.Y. One male only.

**Dictyna quadrispinosa,** n. sp.

Male 2 mm. long. Colours and markings like *muraria*. The male palpi have the tibia wider than long. The usual two spines are sessile at the front edge of the tibia on the outer side, they are close together and curved down from the base and upward at the points. Behind the two spines is a ridge somewhat longer than the spines, ending in blunt points above and below.a (Pl. 7, Fig. 5, a, b.) The palpal organ is smaller than in *muraria*, and the tube and its supports more slender. (Pl. 7, Fig. 5, c.)

Black Brook, Clinton Co., N.Y., June, 1916. C. R. Crosby.

**Pardosa vancouveri** Emerton, Can. Ent., Aug, 1917.

The original description was of the female only, the male has since been found and resembles the female in size, colour and markings, with slightly longer legs and smaller abdomen. The male palpus ( Pl. 7 Fig. 6) has the basal process very long and flattened and curved obliquely across the palpal organ. The whole palpus is very dark coloured and the details hard to see.

Near Lytton, B.C., from W. Taylor, Vancouver.

**Amaurobius agelenoides,** n. sp.

Female 9 mm. long. Male a little shorter and more slender. Colours pale yellow and brown in a distinct pattern on the back. The cephalothorax is brown with pale lateral stripes and a pale middle stripe half as wide as the head extending from the eyes to the dorsal groove. (Pl. 7, Fig. 1 a) The legs are pale with fine, dark hairs. The abdomen has a pale middle stripe divided in two in the front half and broken by several indistinct, dark middle spots behind. The rest of the abdomen is brown above and below without any other distinct markings. The upper spinnerets are twice as long as the lower pair, with the terminal joint conical and as wide as long. The cribellum is two-thirds as wide as the lower spinnerets and distinctly divided across the middle. The calamistrum is three-fourths as long as the fourth metatarsus, but does not show at all in the male, which also has the cribellum narrower and less easily seen than in the female. The epigynum is more open than in *sylvestris* and *pictus*, the middle lobe wide and dark coloured. (Pl. 7, Fig. 2 b.) The male palpus has two processes on the outer side of the tibia, which show best when seen from below. (Pl. 7,Figs. c, d.) The tarsus is twice as long as wide, widest near the base, and nearly straight on the inner side. (Pl. 7,Fig. d.)

Immature individuals have long been known, but only in the summer of 1918 were adults secured, the male by C. G. Hewitt at Jasper, and the female by N. B. Sanson at Banff.

**Clubiona furcata,** n. sp.

Male 4 mm. long. Pale with the abdomen reddish in alcohol. The size, eye arrangement, and length of legs resemble *C. abboti*. The male palpus has the tibia short with the long, outer process curved downward and outward with

a short fork at the end. (Pl. 7, Figs. 7, a.) The palpal organ, (Pl. 7, Figs. 7, b), is long and somewhat like that of *C. canadensis*.

Saskatoon, T. N. Willing.

**Clubiona saltitans**, n. sp.

Male 3 mm. long. Female 3.5 mm. Cephalothorax 1.5 mm. Colour pale, less red in alcohol than *C. abboti*. Eyes of the upper row in line with the front row and covering the whole width of the head. (Figs. 14, d.) Length of mandibles equal to width of head and slightly longer than in *abboti*. The male palpus resembles that of *abboti*, but is more slender and the outer process of the tibia has the lower branch one-half longer than the upper. (Figs. 14, a, b.)

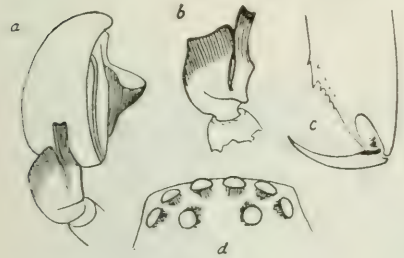


Fig. 14

It has been found at several places near the seashore under stones and sticks on the sand. It sometimes jumps when pursued.

This species has been confused with *C. abboti*. In general it is slightly larger, paler and more slender, and the tarsus of the male palpus is distinctly smaller. The mandibles are slightly longer, but the arrangement of the teeth is the same in both species. (Figs. 14, c.)

Ipswich, Plum Island and Wellfleet, Massachusetts.

**Xysticus acquiescens**, n. sp.

Male 5.5 mm. long. Legs very short, the first and second pairs 7 mm. long. The general colour is brown, the first legs a little darker and the palpi lighter than the rest. The cephalothorax has the light middle stripe much darkened with brown in the front half. The abdomen has the usual markings in pairs, the hinder pairs united into transverse stripes. (Pl. 7, Figs. 1, a.) The first and

Fig. 15

second legs have the femur, patella and tibia darkly spotted with brown, and the tarsus and metatarsus a little lighter. The male palpus has the two processes of the palpal organ both small, the basal one simple and the distal one narrow at the base and thickened at the end where it curves toward the other. In front of the two processes is a wide, dark brown ridge. (Fig. 15, b.)

Saskatoon, T. N. Willing.

**Xysticus ontariensis,** n. sp.

Male 4 mm. long. First and second legs 9 mm. Cephalothorax dark brown, showing a middle stripe very indistinctly. The first and second legs have the femur and patella dark brown, and the rest of the leg pale. The third and fourth legs are spotted as usual but not very strongly marked. The abdomen has

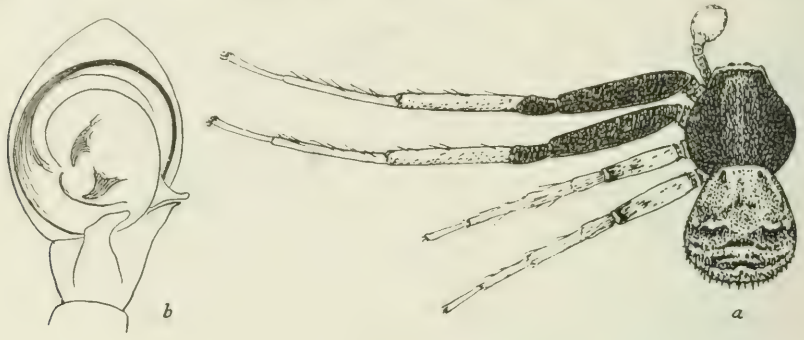



Fig. 16

two irregular brown patches on the front half, and three or four transverse stripes behind all with irregular outlines and variable colour. (Fig. 16, a.) The male palpus has the tibia white. The palpal organ has the two processes on the under side, simple hooks turned toward each other as in *X. gulosus*, with which this species has been confused. (Fig. 16, b.)

Cloyne, Ontario, A. B. Klugh; Wellesley, Massachusetts.

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## NOTES ON COCCIDÆ—III. (HEMIPTERA).*

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

Continued from Can. Ent., vol. 50, p. 332.

### Genus **Stigmacoccus** Hempel.

1903. Fernald, Cat. Coccidæ, p. 20.

Monophleboid Coccidæ in which the adult female possesses mouth-parts, legs and antennæ, the latter 7–8-segmented; immature stages without legs and with the antennæ reduced to mere chitinized points, with an anal tube formed by the chitinization of the posterior portion of the alimentary canal, this tube terminating at its inner extremity in a series of tentacle-like processes. Abdomen in adult and penultimate stages with 8 pairs of spiracles.

Type of the genus, *Stigmacoccus asper* Hempel.

*Notes.*—The original description of the type species was based upon the adult alone and the immature stages have not been described. In general the genus appears to be quite similar to *Xylococcus*, but the very peculiar character of the anal tube alone seems sufficient grounds for its separation.

Whether the genus *Perissopneumon* Newstead is a synonym of *Stigmacoccus*, as Cockerell has indicated, is perhaps doubtful.

### **Stigmacoccus asper** Hempel.

Fig. 17.

*Penultimate stage.* Enclosed in a test, as described by Hempel for the adult female. Body more or less spherical, with the anal opening high up on the dorsum. Derm membranous throughout, except for a small, circular,

chitinized area surrounding the base of the anal tube, everywhere beset with small, spike-like spines. Legs lacking. Antennæ reduced to mere chitinized points. Anal tube of a very distinctive type (Fig. 17A), its inner end terminating in a series of tentacle-like processes (in my single specimen 7 in number), these processes and the tube itself thickly beset with pores. Dermal pores of three types. Of these, one (Fig. 17B) is more or less 8-shaped, with one of the loculi

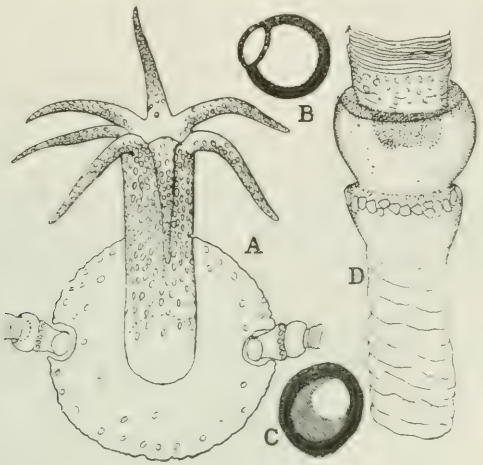


Fig. 17.—*Stigmacoccus asper* Hempel. A, anal tube, with chitinized area and spiracles at its base; B, 8-shaped pore; C, simple pore, from clusters about spiracles; D, spiracle, external opening at lower end.

much smaller than the other. Another resembles the first in shape, but is much smaller and is borne at the inner end of a short duct. The third (Fig. 17C) appears as a simple ring with the enclosed area partially chitinized. The pores of the last type form clusters about the spiracles; those of the first two types are scattered about over the body. Eight pairs of abdominal spiracles present, all of the type indicated in Fig. 17D. The last abdominal pair are situated at the edge of the circular, chitinized area which surrounds the base of the anal tube.

*Material examined.* Part of the type material, this including a single immature individual.

Genus **Xylococcus** Loew.

1903. Fernald, Cat. Coccidæ, p. 32.

1917. Florence, Ann. Ent. Soc. Am., vol. 10, p. 147.

This genus has been assigned by previous authors to the subfamily Margarodinæ because of the supposed absence of mouth-parts in the adult female. I have at hand a series of adult females of *X. macrocarpæ* Coleman, and in this series practically every stage from a complete absence of mouth-parts to mouth-parts which are to all appearances functional is represented. It appears from this series that the foundations of the mouth-parts are probably always present, but that in some instances they do not become chitinized.

I have not observed mouth-parts in the adult females of other species of *Xylococcus*, but the number of specimens examined is small, and it is not at all improbable that the examination of a long series would reveal conditions similar to those found in *X. macrocarpæ*.

It is becoming increasingly evident that the distinction heretofore drawn

between the Monophlebinæ and the Margarodinæ on the basis of the presence or absence of the mouth-parts in the adult female cannot be maintained.

### **Xylococcus betulæ** Perg.

1898. *Xylococcus betulæ* Pergande, U. S. Dept. Agric., Div. Ent., Bull. 18, n. s., p. 18.

1917. *Xylococcus alni* Florence, Ann. Ent. Soc. Am., vol. 10, p. 158.

There is, I think, no question that these two species are identical. I have at hand the types of *X. alni* and specimens of *X. betulæ* as follows: from "cherry birch," Port Colborne, Ontario, Canada, adult female, intermediate stages and larva; from beech, Ithaca, N.Y., intermediate stages; from beech, Michigan, adult female, intermediate stages and larva.

The characters used by Miss Florence for the separation of *X. alni* are hardly sufficient. The differences in the anal tube of the apodous stages are not constant. The first larval stage of *alni* (in the two specimens examined) has 6–7 median ventral pores and the first stage of *betulæ* (in numerous specimens) has but 5, but in all other respects the two are identical.

Whether *X. quercus* is distinct is questionable. There appear to be certain differences in the first stage, but if these differences be allowed as of specific value it will be necessary to name another species for specimens taken from *Quercus californicus*. More material is desirable before forming any conclusions.

*X. macrocarpæ* Coleman is very distinct. I would separate this from *X. betulæ* by the following characters:

Adult female with the derm of the dorsum practically destitute of spines; anal tube of apodous stages with pores at the inner end only; marginal pores of first stage sessile, *X. macrocarpæ* Coleman.

Adult female of the dorsum everywhere quite thickly beset with slender spines; anal tube of apodous stages with pores both at the inner end and near the base; marginal pores of first stage borne at the inner end of short ducts.....*X. betulæ* Pergande.

### Genus **Kuwania** Ckll.

1903. Fernald, Cat. Coccidæ, p. 30.

1909. Cockerell, Can. Ent., vol. 41, p. 56.

Monophleboid Coccidæ in which the adult female appears normally to lack mouth-parts but with the legs and antennæ present; tarsal claw without digitules, the tibia with numerous digitule-like hairs on the inner side at its apex; intermediate stages without legs and with the antennæ reduced to mere chitinized points, anal tube lacking. Four pairs of abdominal spiracles present in adult and penultimate stages, these on the anterior segments of the abdomen.

Type of the genus *Kuwania quercus* (Kuwana).

*Notes.*—I am inclined to doubt that *K. zeylanica* (Green) is congeneric with *K. quercus*. The immature stages have not been described, and it is upon these that the matter will largely depend, the adults of all of these forms being quite similar. I have at hand an adult female of *K. zeylanica* which differs from the same stage of *K. quercus* in having well-developed mouth-parts with a distinct mentum, and in having 6-8 pairs of abdominal spiracles.

**Kuwania quercus** (Kuwana).

Fig. 18

1903. Fernald, Cat. Coccidæ, p. 30..

1917. Ferris, Can. Ent., vol. 49, p. 377, fig. 39b.

The general characteristics of the adult female have been described by Kuwana, but there remain certain points of interest. The mouth-parts appear really to be lacking as they are absent in all of numerous preparations examined It is not impossible, however, that further examination would reveal a condition similar to that found in *Xylococcus macrocarpæ*.

There are four pairs of abdominal spiracles (not noted by Kuwana), these of the type shown in Fig. 18. D.

*Penultimate stage.* Oval in form (Fig. 18C). Antennæ reduced to more chitinized points. Spiracles arranged as in the adult but of a quite different

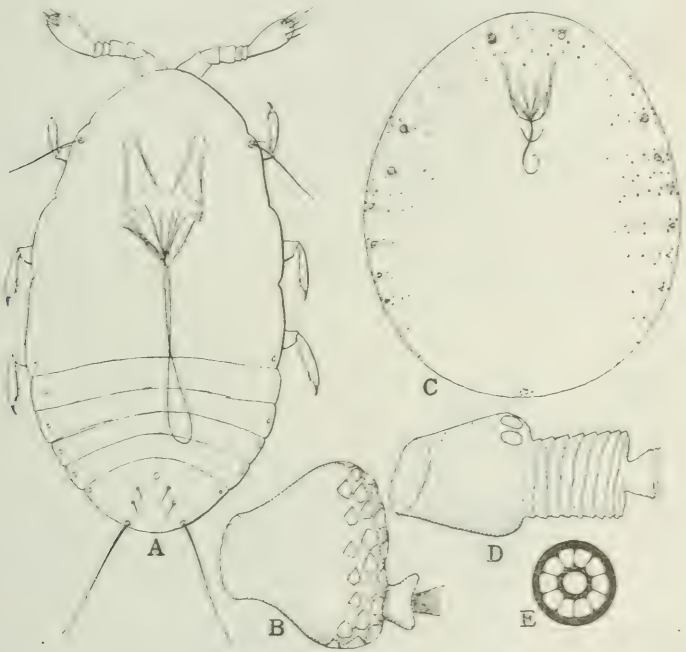


Fig. 18.—*Kuwana quercus* (Kuwana). A, larva; B, spiracle of apodous stage C, apodous stage; D, spiracle of adult; E, pore of apodous stage.

form (Fig. 18B). Margins of the body with large, circular pores (Fig. 18E), these most numerous toward the head. Anal opening simple, without an anal tube.

*First stage larva.* (Fig. 18A). The description given by Kuwana appears to be accurate except for the statement, "Margins of the body with capitate hairs." These hairs do not appear in my specimens. The larva is so minute that I have been unable to detect the arrangement of the spiracles, or, indeed, whether or not they are present. Each abdominal segment bears at the margin a small object that may be either a pore or a spiracle.

*Material examined.* Preparations from the type material.

## Genus **Cissococcus** Ckll.

Coccidæ referable to the subfamily Coccinæ. Adult female with the anal plates borne at the apex of a low prominence, their dorsal surface beset with numerous small spines; antennæ and legs present but extremely small; stigmatic depressions apparently lacking, their presence not indicated by differentiated spines. First stage larva likewise without differentiated stigmatic spines.

Type of the genus *Cissococcus fulleri* Ckll.

*Notes.*—The original description of this genus is much in error. The author states, "Belongs to the Eriococcini. *Larva* typically Eriococcine, with rows of dorsal spines. . . *Adult* . . . with a pair of plates simulating those of the Lecaniinæ." The larva is in all respects of the type usual in the Coccinæ (=Lecaniinæ) and is entirely without dorsal spines. The anal plates of the adult are very much of the type seen in *Ceroplastes*, except for the numerous spines on the dorsal surface. In spite of the gall-making habit the genus is indeed possibly close to *Ceroplastes*.

The species described by Ehrhorn as *Cissococcus ? oahuensis* has nothing to do with *C. fulleri* and has quite properly been referred by its author to a new genus.

### **Cissococcus fulleri** Ckll.

Fig. 19.

My single adult specimen is not in sufficiently good condition to permit adding much to the description already given for the genus. The anal plates (Fig. 3C) are rather long, the lateral margin rounded, the tips quite pointed, resembling in this respect the type of plates seen in Ceroplastes. There appear

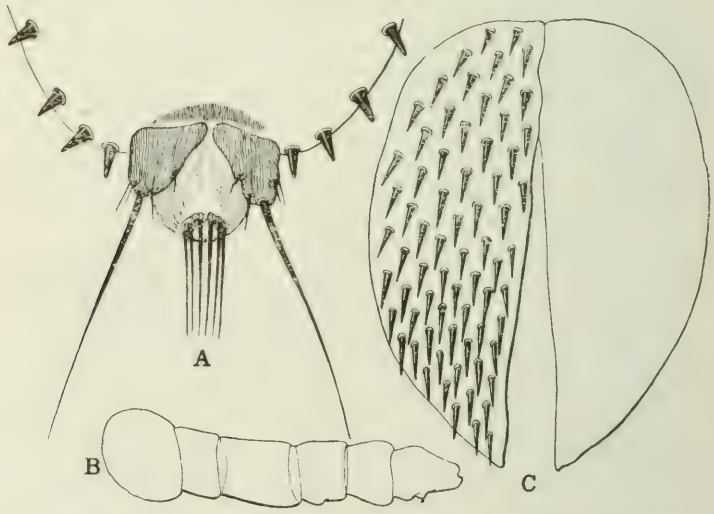


Fig. 19.—*Cissococcus fulleri* Ckll. A, posterior extremity of abdomen of larva, showing the eversible anal tube, which is characteristic of the Coccinae; B, antennæ of larva, setæ not indicated; C, anal plates of adult, spines of dorsal surface indicated in but one plate.

to be no marginal spines. The antennæ are extremely minute, with the number of segments undeterminable; the legs are likewise very small but possess the normal parts.

The first stage larva bears a marginal series of short, stout spines (Fig.

19A); the antennæ are 6-segmented, rather short and stout; there are no dorsal spines.

*Material examined.* Part of the type material.

### Corrections to Earlier Papers.

In my description of *Stomacoccus platani* (2) the caption for Fig. 38B has been omitted. This is the antenna of the prepupa of the male. On page 376 it is stated that the antennæ of the prepupa of the male are 8-segmented, while the figure shows 9 segments. The figure is correct.

In the redescription of *Cryptokermes brasiliensis* Hempel (3), the second line on page 222 reads in part, "posterior portion of anal ring." This should read, "posterior portion of alimentary canal."

## *THREE NEW SPECIES OF BRACONIDÆ.

BY C. F. W. MUESEBECK, ITHACA, N.Y.

### Apanteles phigaliæ, n. sp.

*Female.*—Length 2.2 mm. Black, shining. Head transverse, broad; mandibles reddish brown; palpi yellowish; face slightly convex, medially punctate, and with a distinct median ridge originating between the antennæ; antennæ black. Mesoscutum closely punctate; scutellum distinctly but shallowly punctate, slightly convex; both mesoscutum and scutellum shining. Mesopleura punctate cephalad and ventrad, and with a large, shallow, perfectly smooth and highly-polished area posteriorly, which does not possess the crenulate fovea common to many species of the genus. Propodeum smooth and shining, with a number of short radiating striulæ extending upward from the middle of the posterior margin; no median carina nor median fovea present.

Wings.—Tegulæ and wing-bases black; veins and stigma brown; radius and transverse cubitus meeting in a sharp angle, with a distinct heel at the point of union, the two veins about equal in length. Legs.—All coxæ black, the posterior rather smooth, above with a basal elongate-oval flattened shining area, which has a few scattered punctures; all trochanters dusky; fore and middle femora somewhat dusky at extreme base, the hind femora dusky at extreme base and apex and along the upper edge, the hind tibiæ dusky at apex, and the hind tarsi, except on the basal two-thirds of the basal segment, entirely dusky.

Abdomen black and shining, moderately broad; first tergite almost twice as long as broad at base, parallel-sided, and rounded off very strongly at apex so that apex is much narrower than base, almost entirely smooth and polished, only the extreme apex being weakly punctate; plate of second dorsal segment triangular, very narrow at base, and three times as broad as apex as at base, three-fourths as long down the middle as broad at apex, and very slightly, or not at all, shorter than the third plate; the basal middle of this plate is smooth and polished, while the apical margin and the apical angles are finely rugulose. The membranous margins along the apical half of the first tergite and all of the second are fuscous, and exceedingly broad along the second plate, the mem-

2. Canadian Entomologist, vol. 49, p. 375-378, figs. 36 to 39, (1917)
3. Canadian Entomologist, vol. 50, p. 221-225, (1918)

*Contributions from the Gipsy Moth Laboratory, United States Bureau of Entomology, Melrose, Highlands, Mass.

branous portion on either side of this plate being almost as large as the plate itself. Segment three and beyond smooth and shining. Ovipositor subexserted.

*Male.*—Like the female except for the usual sexual differences.

*Type locality.*—Melrose Highlands, Mass.

*Type.*—Gip. Moth Lab. No. 12007N-16. Deposited in U. S. Nat. Mus. Type No. 22095 U. S. N. M.

*Host.—Phigalia titea* Cram.

Described from 21 specimens (13 females; 8 males) bred by Mr. R. T. Webber, of the Bureau of Entomology, at the Gipsy Moth Laboratory, Melrose Highlands, Mass., from nearly full-grown larvæ of the above species, June, 1916, the adult parasites issuing the following spring.

Cocoons are light brown in colour, parchment-like, and have about eight strong, regular, longitudinal ridges; they are broader at the anterior end and taper considerably toward the posterior end; they resemble somewhat the cocoons of some species of the closely-allied genus *Microplitis* Foerst., especially those of *M. gortynæ* Riley, but are much smaller. Although this species of Apanteles is gregarious the cocoons are not fastened together, but are formed individually on the back of the caterpillar.

The species resembles somewhat *Apanteles feltiæ* Vier., but differs as well in the paler stigma and lighter legs as in the second abdominal tergite being considerably longer in proportion to its width at the apex.

**Apanteles compressus,** n. sp.

*Female.*—Length 2 mm. Black, shining. Head transverse; face punctate, slightly broader than long; palpi yellowish white; antennæ yellowish-brown on scape and basal third of flagellum, darker on apical two-thirds; apical flagellar segments of antennæ broad, almost as broad as long and broader than the basal segments. Mesoscutum and scutellum closely punctate, the latter somewhat less so medially, only slightly shining; scutellum narrow, distinctly longer than broad at base, very slightly convex. Mesopleura punctate and dull anteriorly and below, smooth and polished above and posteriorly, where there is a long, narrow, finely crenulate, longitudinal channel. Propodeum very finely rugose, the posterior angles deeply sunken and shining; a very weak suggestion of a median carina on the propodeum.

Wings.—Tegulæ and wing-bases black; stigma and veins brown; radius and transverse cubitus forming a rather uniform arc, without the sharp angulation at the point of union as found in many species of the genus. Legs.—Fore and middle legs entirely yellowish; hind coxæ black, smooth and shining, having only a few distinct punctures at base above; hind trochanters and femora yellow, except the upper edge of the femora dusky on the apical two-thirds; hind tibiæ blackish except on basal fourth, where they are yellowish; hind tarsi dusky except at base of basal segment; spurs of the hind tibiæ not one-half as long as the metatarsus.

Abdomen black, shining; very narrow, being greatly compressed at apex; first tergite long, narrow and parallel-sided, twice as long as wide at base and narrower at apex than at base, very finely rugulose, feebly striate at extreme sides; second tergite triangular, only one-half as broad at base as long down the middle, and three times as broad at apex as at base, almost entirely smooth and polished, only the apical angles finely rugulose, this rugosity extending toward

middle along the margin; membranous margins along apical third of first plate and all of the second, broad, dark testaceous; third tergite and beyond very smooth and shining; ovipositor subexserted.

*Males.*—Agrees well with the female except for the usual sexual differences.

*Type locality.*—Lunenburg, Mass. Cocoon mass with the host larva firmly attached collected by Mr. S. M. Dohanian, of the Bureau of Entomology. Paratype localities.—Exeter, N. H.; Pelham, N. H.; Bristol, R. I.

*Type.*—Gip. Moth Lab. No. 10697AK. Deposited in U. S. Nat. Mus. Type No. 22094 U. S. N. M.

*Host.*—Evidently a species of *Hypoprepia.*

Described from 24 specimens (13 females; 11 males) bred at the Gipsy Moth Laboratory, Melrose Highlands, Mass.

Cocoons are pure white, thin, clustered together, and usually firmly cemented to the under side of the host caterpillar.

Resembles very closely *A. sarrothripæ* Weed, but the latter has a much less punctate and a highly polished mesoscutum and scutellum; the apical flagellar segments of the female antennæ are much longer than broad and much more slender than in the present species; the hind coxæ are reddish black rather than black; and the abdomen has more or less reddish on the segments posterior to the second, while in the present species the dorsum of the abdomen is entirely black; also, the venter of the abdomen is more testaceous in *sarrothripæ*, and the second abdominal tergite is broader at base so that the lateral margins are less oblique; the venation of the anterior wings also differs, in that the radius and the transverse cubitus meet in a sharp angle in *sarrothripæ*. From the species *phigaliæ*, described above, *compressus* may be distinguished by the much narrower and more compressed abdomen, by the yellowish fore and middle coxæ, by the rougher propodeum, and by the cocoons.

### Meteorus triangularis, n. sp.

*Female.*—Length 5 mm. Head yellowish; eyes black; antennæ yellowish red; stemmaticum black. Prothorax, meso- and metapleuræ yellowish red; mesonotum yellow except the lateral lobes, which are black; scutellum yellow; postscutellum blackish; propodeum black, except the apical angles, which are reddish.

Legs entirely yellowish, except the hind tibiæ, which have a dusky annulus near the base and another at the apex, and the hind tarsi, which are dusky. Wings hyaline, stigma and veins brownish, the stigma without the dark spot found in some species of the genus; the recurrent vein interstitial with the first transverse cubitus; tegulæ and wing-bases yellow.

Abdomen blackish brown above, except the extreme base of the first tergite, which is yellowish, and a yellowish-brown triangular spot at the base of the second tergite, which extends across the entire plate, but is very narrow laterally; the first tergite is longitudinally aciculated on the apical two-thirds or more, which part is black in colour; the deep fossæ, which are found on the upper side of the petiole of a number of species of Meteorus, are wanting in this form. Ovipositor half the length of the abdomen.

*Male.*—Resembles the female except for sexual differences.

*Type locality.*—Mass. (?)

*Type.*—Gip. Moth Lab. No. 6988-1. Deposited in U. S. Nat. Mus. Type No. 22096 U. S. N. M.

Described from eight specimens (4 females; 4 males) reared at the Gipsy Moth Laboratory, Melrose Highlands, Mass. A note in the files at the Gipsy Moth Laboratory, and relating to these specimens, reads, "from a geometrid tray, July 7, 1914."

Cocoons pale brownish, very similar to those of *M. communis* Cress. in colour, density and size.

Rarely the abdominal tergites beyond the first are largely brownish yellow, instead of blackish brown, as in the type specimen.

## A NEW COCCID ON THE COCOANUT PALM.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

Mr. R. C. McGregor, of the Philippine Bureau of Science, recently visited the Island of Batbatan, from which, so far as I can learn, no insects have previously been obtained. Among the various things he found, the following is perhaps the most interesting.

**Furcaspis hæmatochroa,** sp. n.

Female scales on leaves of cocoanut palm, scattered. Scale deep rich red, suggesting a drop of blood; circular, slightly convex, with the large, circular exuviæ to one side, often reaching or slightly overlapping the margin, first skin nipple-like, prominent; width of scale about 2.5 mm. Male scales suboval.

Female without circumgenital glands; in form and details of structure closely resembling *F. oceanica* Lindinger, but distinguished by the broad, squarely

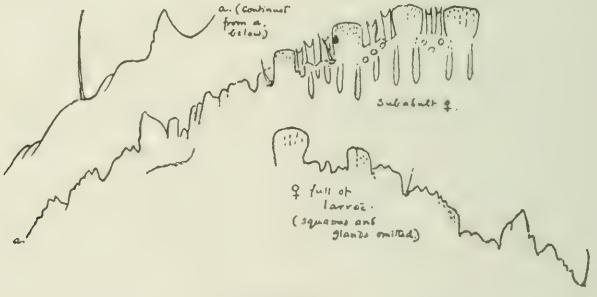


Fig. 20

truncate lobes, the bidentate (not tridentate) squames, and the very prominent pointed elevations on the abdominal margin between the lobes proper and the long, lateral bristle. The details of structure are better indicated by a figure than described. Larvæ in female very large, length about 360 microns. Batbatan Island, Antique Province, Panay, P.I.; June 30, 1918, (*McGregor*). The scale of *F. oceanica* also differs in being suboval instead of circular.

From *F. capensis* (Walker), the new species is known at once by the bifid or bidentate end of the squames and the very broad lobes. It also lacks the series of long hairs found on the cephalothorax of *capensis*. From *F. cladii* (*Aspidiotus cladii* Maskell) it is equally distinguished by the form of the squames, as well as the lateral dentiform process of the abdomen. The lateral dentiform processes are developed in *F. biformis* (Ckll.), which occurs on orchids; but that has a much darker scale and is otherwise different.

# A METHOD FOR THE PRESERVATION OF INSECT LARVÆ AND PUPÆ.

BY F. SLATER JACKSON, M.D., McGILL UNIVERSITY, MONTREAL.

During the summer of 1916 the writer devised a method (as yet unpublished) for the preservation of fresh-water Bryozoa in an expanded condition. At that time, as a matter of experiment, several larvæ and pupæ of *Nymphula maculalis* were placed in the fluid employed for this purpose, with fairly satisfactory results. It was subsequently used for the preservation of insects in all stages. Among these were the larvæ of *Mamestra picta* and other Lepidoptera, and the pupæ and imagines of *Physonota unipuncta*, all of which seem to have retained satisfactorily their form and colour.

Several members of the Montreal branch of the Entomological Society, among others, Mr. A. F. Winn and Mr. Geo. A. Moore, obtained good results with the same fluid. In a letter of February 28th, 1918, Mr. Arthur Gibson, Chief Assistant Entomologist, writes: "I used it rather freely for preserving larvæ of different kinds. . . . I have also spoken of its value to several of our field officers. I hope very much that you will publish your formula soon, as I know many workers will find it of value." These encouraging reports led to further experiment, with the view of obtaining a modification of this fluid which might prove more widely useful as a preservative for material of this character.

It had been found that in many instances, e. g., in the case of large Lepidopterous larvæ, there was frequently marked alteration or loss of colour, and a considerable degree of shrinkage. Pressure of other work, however, and a period of incapacity for concentration of effort, led to the postponement of this matter, until during the past summer opportunity was afforded for further experimentation, which resulted in the provisional adoption of the following method.

The specimens, having been killed in the cyanide bottle, or by means of chloroform vapour, are allowed to relax, straightened if necessary, and placed in a fluid having the following composition:—

*Fluid a.*

| | |
|---|---|
| Cane sugar | 10 parts |
| Glacial Acetic acid | 5 " |
| Formalin | 2 " |
| Distilled water to | 100 " |

The sugar is to be dissolved in the water, and the acetic acid and formalin subsequently added.

In this fluid the specimens are allowed to remain for about 24 hours. They are then transferred directly to *Fluid b.*, which is identical in composition except that the acetic acid is omitted—it being, in fact, simply a 10% solution of sugar in 2% formalin. After about 24 hours this fluid should be changed, and in the case of large specimens a further renewal after the lapse of a week or ten days is advisable, since traces of acetic acid tend, in some instances, to destroy colour.

Attention to the following details may be of assistance in obtaining the best results.

1. In the case of specimens which tend to float, on account either of an oily surface, or through the accumulation of air bubbles (as e. g. in Arctiids, etc.) a preliminary immersion for a few moments in 70% or 90% alcohol will be found to facilitate their contact with and penetration by the fluid.

2. In dealing with large or transparent larvæ, it is well to starve the specimens for a few hours before killing, in order that the alimentary canal may be emptied of its contents. For this suggestion I am indebted to Mr. A. F. Winn.

3. In the case of elongated larvæ, if tubes be employed, they should be almost completely filled with the fluid A., and then allowed to lie horizontally until the transfer to fluid B. is made.

While it is not claimed that the above method is applicable to all forms, or that all colours will be permanently preserved, it has yielded good results in the hands of the writer, and in those of the gentlemen who have so kindly, at his suggestion, given it an extended trial. Larvæ of widely-differing types, such as the following, have been satisfactorily preserved:—various Arctiids and Geometrids, *Euvanessa antiopa*, *Datana* spp., and *Nymphula maculalis*, together with numerous Coleopterous larvæ and the nymphal stages of a number of Hemiptera.

In any event the method is one of easy application, and the ingredients for the preparation of the fluid are cheaply and easily obtainable. No more satisfactory means of preserving insect larvæ and pupæ is known to the writer, by whom this note is submitted in the hope that the method, while admittedly not of universal application, will be found to be of service, and by whom any reports of its successful employment, or suggestions as to its modification, will be gratefully received.

Zoological Laboratory, McGill University, Oct. 29, 1918.

## NOTE ON *CHALEPUS NERVOSA* PANZ. AND ITS PROBABLE FOOD PLANT.

The reading of the "Notes on *Chalepus rubra* in New Jersey," published in the December number of the Canadian Entomologist, has prompted me to give a short account of a somewhat similar observation I made last Spring on *Chalepus nervosa* Panzer, the only one of the five recorded Canadian species that I have taken in this Province.

On May 16th, 1918, while doing some outdoor entomological work in that part of Montreal mountain bordering the grounds of the Outremont Golf Club, I noticed that every time the sweeping net was being emptied of its contents, a good supply of this little beetle could be dropped into the killing bottle. The thought struck me of finding out which plant they were being swept off. An active search was then made all around, which soon gave me the desired result. The slow, harmless little being was found in colonies of four, eight or more on the leaves of *Solidago latifolia* L., then but a few inches tall. Some of the plants sheltered no less than a dozen specimens. As it was surely mating time, one would have been able to take hundreds of them in an hour. Never before had I met them in such numbers.

They are most easily taken with the hand, provided you do not touch the plant before seizing the insect; a jerk of the stem will bring down the whole

colony to the ground, where they will lie motionless and quite invisible, so that you had better give up looking for the tricky little creature.

No further observations have been made on the habits of the insect, nor have I even seen the larva or the eggs. So we may still doubt if *Solidago latifolia* be really the food-plant of *Chalepus nervosa*. This question might be elucidated next season, and it would also be interesting to find out what sort of damage the beetle causes to the foliage of this handsome wood Goldenrod.

Blatchley, in his work on the Coleoptera of Indiana, says that *Chalepus nervosa* occurs on weeds and bushes of many kinds. So far, I have not seen the beetle crawling in number over any plant except *Solidago latifolia*.

Is it not strange that the discovery was made only after more than twenty years of very active collecting?

Outremont, Que., Jan. 11th, 1919. JOS. OUELLET, C.S.V.

## A NEW PARAJULUS FROM BRITISH COLUMBIA.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

In a small collection of Chilopods and Diplopods collected by Dr. C. Gordon Hewitt in British Columbia, Sept., 1918, were several specimens of a new species of Parajulus. These were collected at Agassiz. From the same locality were also secured representatives of *Harpaphe haydeniana* (Wood) and *Bothropolys hoples* (Brölemann). A specimen of *Paobius orophilus* Chamberlin, previously known from Kaslo, was taken at Jaspa, Goat Mountain, at an elevation of 7,000 feet.

**Parajulus hewitti,** sp. nov.

The general colour of the female is brown above with the sides paler, a series of small, black spots along each side caused by the black repugnatorial

Fig. 21.—*Parajulus hewitti*, sp. n.
Anterior view of gonopods of male.

glands. The male is darker in colour throughout. The posterior border of metazonites darker down the sides or in the form of an encircling annulus. Anal valves dark. Collum dark along the borders, the remaining portion covered with a dense network of dark lines as is frequent, such also covering the

vertex of the head which is dark excepting the clypeal region. Antennæ brown. Legs yellow.

In the male the second tergite extends much below the level of the collum and is angularly produced below at anterior corner. In the male the second tergite is on the same level below as the collum. The collum is more elongate than in the female, as usual, and the longitudinal stria above the lateral border is strongly marked. On each side of the second tergite below are typically three longitudinal striæ in the male.

The cardo of mandibles of the male is large. It is concavely excavated below, leaving a larger angular anterior process and a smaller posterior one.

Segmental suture in a well-impressed encircling groove, widely curved opposite the pore from which it is well removed.

Cauda of anal tergite straight, caudally rounded, decidedly exceeding the valves in both sexes.

First legs in male strongly crassate and uncate as usual.

The species is most readily to be distinguished by the structure of the gonopods of the male, particularly by the form of the second pair. These are distally branched, presenting two acute spurs, visible in anterior view, projecting from beneath the plate of the first pair, one of them being apical, and a larger mesal principal branch which curves mesad against the corresponding branch of the other gonopod as shown in the accompanying figure.

Number of segments mostly forty-six or forty-seven.

Length near 27 mm.

## OVIPOSITION OF *RHINOGASTROPHILUS NASALIS* L.

Referring to Mr. A. E. Cameron's article in *Science* for January 3, 1919, p. 26, I would insist that my observations, as recorded in *Can. Ent.* for July, 1918, are absolutely correct. In repeated instances I saw the fly strike at the muzzle of the horse just as I have described. While the egg of *nasalis* is easily to be distinguished from that of *intestinalis*, I still maintain that both are "practically the same size and shape" as compared with that of *haemorrhoidalis*. I also still believe that my tentative conclusions as to the method of oviposition are extremely probable. As to the observations recorded, they are not inaccurate in any sense.

C. H. T. TOWNSEND.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### THE VARIATION OF INSECTS.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

Nearly thirty years ago English entomologists began to take a new interest in the variation of Lepidoptera, and in the interval since that time, principally owing to the activities of J. W. Tutt, a very large amount of detailed information has accumulated. Tutt's "British Noctuæ and Their Varieties," in four volumes (1891-1892), deserves to rank as a classic, although at the time of its publication it was received by many with something less than enthusiasm. More recently, the great monograph of the British Lepidoptera, left unfinished owing to Tutt's untimely death, covered the subject of variation in an exhaustive manner, including all phases of the species treated, whether British or foreign. In its exhaustive character, this work runs parallel with Taylor's Monograph of the Land and Fresh-water Mollusca of the British Islands, still in course of publication. The variation of Lepidoptera also receives very full treatment in "The Macrolepidoptera of the World," edited by Dr. Adalbert Seitz, and published in English, French and German. This series of volumes, although planned and published in Germany, is thoroughly international in its character, a large part being written by English entomologists. The volume on the Palæarctic Noctuidæ, for example, is the work of W. Warren. During the war publication has ceased, and I do not know whether it will be continued.

To those who had been concerned primarily with the study of genera and species, all this minute attention to variation seemed rather like counting pebbles on the beach. Let us assume, they said, that all species are variable, and state the facts in general terms. It may be well enough to record varieties, but why give them names? Will not the whole subject be buried in a complex nomenclature? It is, of course, quite true that when one is dealing with a large and little known fauna, the species problem is sufficient to tax one's energies; and, as a rule, the material at hand is not adequate for a study of variation. It is only when the species are fairly well known, and large series of specimens have accumulated, that such methods as those of Tutt become possible or advisable. When, however, the time has come for intensive study, it must be insisted that the records should be exact, and that all looseness of expression should be avoided as far as possible. It is found, in practice, that the only way to avoid ambiguity is to name and define the principal forms, which then become standards for comparison. The literature is full of statements concerning "melanic" or "albinic" or otherwise modified forms, which are so ambiguously referred to that it is impossible to be sure what was intended. Moreover, the adequate taxonomic treatment of the subject gives us a summary of what is known, properly arranged and made intelligible.

While the descriptive side of the study of variation has occupied the attention of many workers, others have taken up the subject for the experimental

side, with results of extraordinary interest, not only to entomologists, but to all biologists. In the earlier days Weismann and Merrifield, in later times such men as Standfuss of Zurich and Morgan of New York, have produced works of such value as to arrest the attention of all naturalists. In particular, Morgan's intensive study of the vinegar-fly, *Drosophila*, has given us a knowledge of the facts of variation and heredity which the most optimistic would have declared impossible a few years ago. Thus all doubt as to the value of minute and detailed investigation of single genera and species has been dispelled, except in the minds of those who take no interest in the biological problems of the day. Indeed, it must be said that any able student who will study a single small group or species from *all points of view*, will be sure to get results of value and importance, whereas as a collector of miscellanea he may go through life without making any significant contribution to science. Thus the new outlook and the new methods open up a great new field for amateurs, who may readily make themselves more familiar than any one else with a special small field of research, knowing at the same time that their discoveries will have some bearing on the whole structure of biological science.

We approach the subject of variation to-day with many advantages not enjoyed by our predecessors. Owing to the rediscovery of Mendel's work, and the great advances in our knowledge of cytology and of the processes of heredity, we are able to interpret what we find with better success. We no longer content ourselves with describing, in objective terms, the phases of variation found, but undertake to classify them according to their true dynamic significance.

Variation may arise from different causes, as follows:

1. Original variation, due to some change in the character of the germ plasm itself. Theoretically, this may come about either through (a) the addition of something, or (b) the subtraction of something, or (c) the redistribution of what was already there, following the phenomena already well known to students of organic chemistry. Tower, of Chicago, appears to have produced variations of this sort in potato-beetles (*Leptinotarsa*), but it is possible to interpret them as the result of selective destruction of elements (genes) in the germ plasm, which is, at least theoretically, a different matter from altering the genes (factors determining characters) themselves. The sudden appearance of red on the rays of a sunflower in Colorado can be interpreted as due to a doubling-up or duplication of a gene for red which is undoubtedly present in the normal wild plant.

   Furthermore, when a variation occurs in a gamete (unfertilized germ cell) which is recessive to the normal,—that is, fails to produce any effect when united with a normal gamete,—it may be an indefinite time, possibly a thousand years, before there will be any visible result. A visible result will only appear when two individuals, each carrying the modified character, chance to mate. Thus when we witness what appears to be an entirely new "break," we may be observing the consequences of a chemical change which occurred long ago, the causes of which, whatever they were, have long ceased to operate.

   The most important evidence has been obtained by Professor Morgan and his associates in their studies of *Drosophila*. In numerous cases new variations have arisen under circumstances which seem to

indicate without question the mutation of factors or elements in the germ-plasma.

2. Variation due to new combinations, or to recombinations of genes normally carried by a species (as in sex-dimorphism, polymorphism, etc.). This is the kind of variation we are most familiar with, and which has been the subject of so much experimental research. Not only may genes or determiners be shuffled in inheritance, as Mendel described, but those constantly present may be greatly modified by the unexpected appearance of others, which have until then escaped notice. Thus in the sunflower there is a series of pattern-factors, which only become evident when the factor for red rays enters the combination.

   In the case of the many mutants of *Drosophila* observed by Morgan, all within the limits of a single species, it is difficult to resist the conclusion that a process of subtraction is going on under our eyes, leaving combinations which are new in the sense of lacking some of the original elements. In other analogous cases, we are struck by the fact that the *same kinds* of subtractions occur in many different genera and species, showing that the tendency to perform these tricks is deep-seated in the protoplasm of the whole race. There is here involved a question which cannot be said to be settled, and to which much additional research must be directed.

3. Variation due to the direct action of the environment, which, as we have learned from Weismann, is not inherited. Nevertheless, the power to react to the environment in particular ways *is* inherited, and hence even these variations cannot be dissociated from the question of heredity.

On the negative side, as it were, we have the facts of palæontology. The study of fossil insects shows us that many apparently trivial characters, such as the arrangements of spots on wings, are of enormous antiquity. Not only this, but as Wheeler's researches on the ants of Baltic amber have shown, specialized habits and reactions are likewise millions of years old. It, therefore, becomes more probable that the phenomena of variation which we witness to-day represent, mainly at least, the shuffling of very ancient cards.

In the Canadian fauna, there are several notably attractive opportunities for the study of variation. I will refer now only to a single family of insects, with which I have been especially concerned in recent years; the Saturniidæ. The publication of Packard's Monograph (Memoirs National Academy of Sciences, vol. XII) brings the subject fairly up to date, and makes it convenient to go forward from the point there attained. The genus *Samia*, as represented in Canada, is extremely interesting. There is not only the question of the relationships of the species *cecropia*, *gloveri*, *columbia* and *rubra*, but *columbia* has in the west a remarkable race *nokomis* (Brodie), while *rubra* produces at Kaslo a form *kasloensis* Ckll. These are merely conspicuous outstanding facts: large collections from many localities, together with experimental breeding, will bring out innumerable details of interest. Another very interesting species is *Telea polyphemus*, the variations of which should be studied exhaustively, and compared with those of the great Asiatic silk-moths. The Hemileucidæ, also included in Packard's book, afford similar opportunities, and owing to their smaller size are somewhat more manageable.

# NOTES ON THE CANADIAN REPRESENTATIVES OF BRITISH SPECIES OF BEES.

BY F. W. L. SLADEN, APIARIST, DOMINION EXPERIMENTAL FARMS.

Of the twenty-eight genera of bees given in Saunders' "Hymenoptera Aculeata of the British Isles," no less than twenty-two occur in Canada. The six absent are small genera belonging to an ill-defined unimportant complex in the *Andrena* group, several of which may yet be found to exist in Canada when this large genus, full of raw material, has been analyzed. In most of the genera common to both countries, there are many Canadian species which are more or less closely related to British species. The following are a few outstanding examples:

## Colletes cunicularia Linn.

*Colletes inæqualis* Say, by far the largest species of *Colletes* in Eastern Canada and the only one occurring in spring, is apparently the representative of *C. cunicularia* Linn., also much the largest species and the only spring one found in England. Both are among the earliest bees to appear in spring. Ottawa specimens differ from British in having a much shorter coat, which is generally paler and greyer (less brown), and they have well-developed bands of white felt* on the margin of each segment of the abdomen. These bands in British specimens are scarcely discernible, being composed of fewer, looser hairs, which are dingy. Ottawa specimens are smaller; several females measured averaged in length 13.33 mm.; British females 14.00 mm.; Ottawa males 11.00 mm.; British males 13.25 mm.

## Andrena clarkella Kirby.

Comparison of a male and two females of *Andrena bicolor* Prov. taken by the writer at Ottawa, and a female from Abitibi, with two males and two females of *A. clarkella* Kirby, taken at Maidstone, Kent, England, and with Saunders' description of this species shows no differences either in structure or colour. Even the tint and extent of the different hair colours in both sexes are identical. The characteristic red and red-haired hind tibiæ and tarsi, and black-haired notum in the female, and the comparative lengths of the antennal joints 3, 4 and 5 in both sexes are the same. The Canadian examples however, are a little smaller:—females, average length 12.00 mm.; Maidstone females 12.75 mm.; Ottawa males 8.75 mm.; Maidstone males 9.75 mm.; and the coat on the thorax and abdomen is much shorter and less shaggy in the Canadian specimens. In both countries these are early spring bees. The Ottawa females were taken during early willow-bloom on April 25, 1915, about ten days after the snow had gone, and the male on April 27. In England it is taken in early March and has been recorded as early as February 19. It is also widely distributed northwards and uncommon, both in Canada and England.

## Andrena wilkella Kirby.

*Andrena winkleyi* Vier. is the same as *A. wilkella* Kirby. I can find no differences in structure or size. Both are abundant in late spring at Ottawa and Dover respectively, and are fond of the same plants; *Myosotis*, etc. In both, the third antennal joint is shorter than the fourth, a character by which *wilkella*

*The word "felt" is used to describe very short, close hair, the individual hairs of which are thicker than ordinary hairs. Felt grades into ordinary hairs.

is known from its close ally *similis* Sm. This is a short-haired species in which white felt bands on the abdominal segments are well developed with a corresponding bare area on the disc of the segment.

### Osmia fulviventris L.

Specimens of both sexes of *Osmia purpurea* Cr. from Ottawa and Toronto agree in every respect, including size, with those of *O. fulviventris* L. from Dover. This is, therefore, a parallel case to that of *Andrena wilkella*, and it is perhaps worthy of note that the *Osmia* appears in late spring after most of the other species of its genus have appeared as in the case of *A. wilkella*.

### Megachile ligniseca L.

Comparison of both sexes of *Megachile inermis* Prov. (*M. decipiens* Lovell and Cockerell) taken at Ottawa, shows this species to be closely related to *M. ligniseca* L. of Europe. Prominent characters possessed in common by specimens from Dover and from different parts of Canada are the very short, decumbent black hair on the disc of the sixth segment of the abdomen and the large head in the female. But the white felt bands on the margins of the segments of the abdomen, well marked in Canadian specimens are rudimentary in the British specimens. Canadian specimens also differ in having the pollen collecting-brush cream coloured—not reddish, and the body hairs grey and black—not brown, and the coat distinctly shorter. Ottawa specimens are also smaller, average length of Ottawa females 14.33 mm.; Dover females 16.00 mm.; Ottawa males 12.61 mm.; Dover males 13.88 mm. Specimens have been bred in this country from a rotting piece of an apple tree found by Prof. Arthur Willey at McGill College. In England it burrows in wood that is more or less decayed. Most of the other *Megachile* burrow in the ground.

The same differences,—shorter coat, which is whiter (less brown) with stronger white felt bands, and paler (less red) pollen brush, separate *M. vidua* Sm., a species common all over Canada from *M. willughbiella* Kirby, a species common in England and Northern Europe.

### Anthophora furcata Pz.

This British bee is represented in the American fauna by a bee known by the name of *Clisodon terminalis* Cr., which occurs in Canada from coast to coast and at least as far north as Cochrane, Ont. and Edmonton, Alta. Friese gives the range of *A. furcata* in Eurasia from Norway to Mongolia and south to Caucasia. Ontario specimens differ from British in both sexes in having a shorter coat—much shorter and scantier on the abdomen of the female and generally less brown but greyer and paler, and the hairs on the abdomen run into dense pale bands on the margins of the segments, taking, in the female the extreme form of narrow bands of white felt, interrupted in the middle. No tendency to white felt bands is noticeable in the specimens from Dover. Saunders even gives this as a character for the species. The white felt bands are also absent in four females from the Pacific Coast, (Agassiz, B. C., Shawnigan Lake, V. I., and Victoria, V. I.) but they may have been rubbed off.

Specimens from Ottawa are distinctly smaller than specimens from Dover, but the females from the Pacific Coast are even larger than British females as shown in the following table, and they probably represent a distinct species or at least a geographical variety to which the name *neofurcata* is here given.

7 Ottawa males average length 9.50 mm.
7 Ottawa females average 10.75 mm.
5 Dover males average length 10.70 mm.
5 Dover females average length 12.80 mm.
4 Pacific Coast females average length 14 mm.

In England, *Anthophora furcata* is very faithful to its food plant, *Stachys sylvatica*, and the Canadian forms may always be found on *Stachys palustris*. Saunders notes that it burrows in "dead wood," although other species of the genus burrows in the ground. Attracted by a heap of white sawdust around a decayed but still hard stump near Hull, P. Q., on August 16th, 1913, I found this to be riddled with the burrows of *Clisodon terminalis*. The exceedingly active females, resembling honey-bees in appearance and size, passed in and out of numerous holes in the stump as frequently as the workers of a strong colony of bumble-bees.

## Bombus and Psithyrus.

These northern genera, so rich in biological material, furnish an interesting contribution to this study. They never develop felt bands but there is a uniform coat of long hair resembling fur.

### Bombus borealis Kirby.*

*Bombus borealis* Kirby, fairly common and widely distributed in the boreal region of Canada east of the Rocky Mountains has its British representative in *B. distinguendus* Morawitz, the distribution of which, according to Hoffer, extends to Siberia. Here again the pattern and even the tint of the coat, deep greenish yellow with a black band across the thorax, very variable in most species of *Bombus*, is common to both forms with the unimportant exception of more or less black hair on the last segment of *borealis*, but the British specimens are larger (average length of females 20 mm. compared to 18 mm. in *borealis*) and they have a much longer and more uneven coat.

In the Mountains and Pacific Coast region, *borealis* is replaced by a form, *appositus*, that is intermediate in size between British *distinguendus* and *borealis*, having a coat slightly longer than *borealis* and the yellow band on the anterior part of the thorax very pale while there are no black hairs on the abdomen. *Appositus* is evidently still more closely related to *distinguendus* than is *borealis*. In both the Old and New Worlds, the queens of all these forms appear later in the spring than those of almost every other species of *Bombus*. The colonies consist of comparatively few workers, and the young queens and drones are raised early. The period of activity therefore lasts a shorter time than in the case of the other species.

### Bombus terrestris L.

One of the commonest and most aggressive species of *Bombus* in England and the continent of Europe is *terrestris L.* This is represented in Canada from the Atlantic Coast to the Mountains by an equally common and aggressive species, *B. terricola*. In habits, *terricola* agrees with *terrestris* not only in those common to the *terrestris* group such as biting holes at the bases of flowers, but also in the unique habit that separates *terrestris* from its close ally in England, *lucorum*, of continuing to leave its winter quarters in small numbers from the opening of spring right on until about mid-July when all other species have

*This name has priority over *distinguendus*.

ceased to appear, instead of during the shorter and more definite period common to all the other species of *Bombus*. *Terricola* has the tip of the abdomen tawny like many *terrestris* forms. In *lucorum* forms, however, this remains always white. *Terricola*, however, has a much wider yellow band on the abdomen than any Old World form of *terrestris*. In this respect it converges towards other species of *Bombus* found within its region, *fervidus*, *borealis*, etc., *Terricola* has the coat much shorter than *terrestris*. It is also smaller, average length of female *terricola* 18 mm., female *terrestris*, from Dover, 20 mm.

*B. terricola* is replaced in the Mountains and on the Pacific coast by the closely related *occidentalis*, a somewhat longer-coated species. I do not think that *terricola* and *occidentalis* intergrade because I have taken both forms at Banff, Alta.

**Bombus lucorum** L.

*Bombus lucorum*, above mentioned, is, in Britain and Europe, a small mountain or northern form with a rather long coat. *B. moderatus* Cr. a species of the *terrestris* group with colour pattern the same as that of *lucorum*, is found at Banff, Alta. and in Northern B. C., Yukon Territory, and Alaska. It undoubtedly is a *lucorum* form. It differs from *lucorum* only in the somewhat paler tint of its yellow bands. In this respect, it not only follows *appositus* of the same region, but approaches *albocinctus* Sm. the *lucorum* form found in Kamchatka, Siberia, which has these bands white.

**Bombus lapponicus** Fab.

Franklin notes the close relation between *Bombus melanopygus* Nyl., a very long-haired, red-banded species, common in the Mountains and Pacific Coast region and *Bombus lapponicus* Zett. a species found on the high moors of the north of England and Scotland and in arctic and sub-arctic Europe. *Sylvicola* Kirby, from Arctic Canada, of which *melanopygus* is probably a variety, seems identical with *lapponicus*.

**Psithyrus vestalis** *Fourc.*

*Bombus terrestris* is preyed upon in England by *Psithyrus vestalis* Fourc. A *vestalis* form known as *ashtoni* Cr. is found throughout the range of *B. terricola* and is probably parasitic on it. *Ashtoni* is smaller than *vestalis* and has a shorter and paler coat.

**Apis mellifera** L.

The variety of honey-bee native to Britain has an entirely black tegument, dark brown hair and feebly-developed white felt bands on the margins of the segments. This variety is native to the whole of Western Europe, and it has been introduced into and has spread through Canada during the last two or three hundred years. It still predominates in the Gulf Region, in the north, and on the Pacific Coast. But in Southern Ontario and on the Prairie, it has been largely replaced by the Italian bee, introduced about fifty years ago from Southern Europe, which has the tegument of the abdomen banded with orange, has paler hair and well-developed white felt bands. This bee is also slightly smaller than the black bee. The honey-bees of the Prairie show great constancy in the strong development of the white felt bands.

CONCLUSIONS.

1. The bee fauna of the boreal zone of America contains a number of species closely related to, and in some cases indistinguishable from those in

north-western Europe and furnishes evidence of a former land connection with a climate comparable to that of Britain or Ontario, in which these species lived.

2. There are, however, in a number of cases certain more or less pronounced differences in character between the descendants now living in Britain and Canada. As a rule, the Canadian forms are smaller, and they have a shorter, closer, less shaggy coat, the colour of which is not so rich or deep, but paler, more dingy; brown changes to ashy grey or dingy white, and red to orange or cream. Usually in the genera where white felt bands are liable to occur on the abdominal segments, these bands either appear for the first time in Canadian forms, or are better developed, that is to say, are wider and more extensive as well as of a more extreme type, with a corresponding reduction of hair on the disc of the segment. Melanism is less frequent and less pronounced. These differences are so widely spread that they evidently represent a definite principle.

3. Searching for the cause of these differences we find there is an approach towards the British type of characters on the Pacific Coast and in the north of Canada where the summer climate is cool as in Britain, and they are most departed from in the interior and southern part where it is warm. A good illustration of this, in addition to those already given, is found in *Megachile perihirta*, Ckll. a species that has no Old World representative. At Lethbridge and in the Kootenays, this species has definite white felt bands on the margins of the abdominal segments and there are no black hairs amongst the pale ones on the apical segment. At Victoria, B. C., the white felt bands are weaker and partly broken, the hairs composing them being longer and less dense, and the whole coat is slightly longer. At Cochrane in Northern Ontario these bands are still weaker and the hair on the apical segment is black.

All the species of *Bombus* occurring on the Pacific Coast, in the mountains of B. C. and in the Arctic, have a longer, shaggier coat than those occurring in Ontario. The species of *Bombus* that has the most southerly range in Canada, *B. pennsylvanicus* has the shortest coat of all. Species of *Bombus* in the Shetland Islands are rather larger and have longer, shaggier coats than the same species in Scotland. In Great Britain and in Canada also, not only are the species having longer and shaggier coats more plentiful in the north and west, but the shorter-coated species, if they extend so far, grow longer coats.

For the same or closely related species, size tends to become as a rule, smaller in the south and interior, but the south-interior contains many species, not found all over, some of which are of giant size.

In Canada, the interior and southern conditions reach their extreme at Medicine Hat, a dry, hot, basin-shaped locality in Southern Alberta. Here the species of *Anthophora* belonging to the subgenus *Amegilla*, characterized by an extreme development of the white felt bands and swift flight, are common. Species of *Amegilla* are numerous in Turkistan, Central Asia. At Medicine Hat species of *Halictus*, *Colletes*, *Melissodes* and *Melecta* appear that are almost covered with dust-like felt. Amongst the parasitic bees, *Coelioxys ribis* Ckll. is common throughout Canada. In Southern Alberta is found a small form of this species known as *grindeliæ* Ckll. (average length of female 10.33 mm. compared with 11.66 mm. of *ribis*). In *grindeliæ* not only are the white felt bands on the abdomen much wider, but the face is largely covered with white felt, and the white hair on the sides of the thorax inclines towards felt. At

Medicine Hat, too, a general change in tegmental colour, which must not be confounded with hair colour, is noticeable. Yellow bands and markings in the bare or nearly bare bees and wasps expand and multiply at the expense of black, and species, often of giant size, having red markings, especially on the first segment of the abdomen begin to appear, notably in the bee genera *Anthidium*, *Epeolus* and *Nomada*, and in the wasp genera, *Vespa*, *Bembix*, *Microbembex*, (yellow); *Philanthus*, *Cerceris* and *Odynerus* (red markings). Several species of *Andrena* from Toronto and Winnipeg regions have a red abdomen, but on the coasts and in the North the abdomen is always black. At Oxford, England, *Andrena hattorfiana* has a red abdomen, but at Dover the abdomen of this species is black.

Reduction of humidity acts in the same way as heat, but it appears to be less important. Indeed, in the present study, it can be demonstrated to be a negligible factor if rainfall be taken as its criterion. The summer rainfall of Dover and Victoria, B. C., is much less than that of Ottawa and Toronto. But humidity cannot be judged by rainfall which increases the relative humidity of soil and air in our region much less than heat reduces it.

Differences in winter temperature and rainfall, however, do not affect the characters to any extent. The same varieties are found on the mild and wet Pacific Coast as on the dry cold mountains. This is the more remarkable when when we remember that the distribution of the plants on which the bees feed is greatly affected by winter climate.

The same differences that are found between bees in a cool coastal summer climate and a warm interior one, are found between spring and summer flying bees in the same climate, and they are more marked in regions like Britain and the Pacific Coast where the spring is cool, than the interior of Canada where it warms up quickly. In England, and to a less extent in Ontario, the one species of *Colletes* that flies in the spring is larger and has a longer coat with feebler felt bands than the many species that fly in summer. Similarly, the early spring flying species of *Andrena* are large, have long coats and no felt bands; the summer flying species are generally smaller (except giant southern forms), have shorter coats with bare areas and frequently felt bands. At Ottawa, *A. cockerelli* which appears in spring before the snow has gone, has a longer, shaggier coat with less tendency to bare areas than any other species in Eastern Canada. Britain and the Pacific Coast have several large, robust, shaggy and long haired species of *Anthophora* appearing in early spring as well as shorter haired summer species, but the long haired spring species are not found on the prairie or in Eastern Canada.

Many of the differences noted are more shown in the females than in the males. Abdominal felt bands are always better developed in the females than in the males. Females of numerous species develop red tegumental markings, while the males remain black or yellow. In many species of *Sphecodes* the abdomen is black in the male and red in the female. In a large wasp found in Medicine Hat, Alta., *Eucerceris gloriosa*, the male is yellow and the female red. In *Vespa carolina*, a species found at Point Pelee, Ont., by Mr. Taverner, the queen has orange markings, while in the workers these markings are yellow. Can the reason be that the female has a longer adult existence, or that the continuance of the species depends solely upon it after the male has died?

Do the cool and warm conditions during the flying season work their opposing effects on the adult or the larva, or both? The female *Halicti* pass the winter as adults, but live on until summer when they raise their brood. They have short coats and are of small size. The honey-bee raises its brood and passes the night in activity under the conditions of all seasons in an artificial heat provided by the colony. The European species of *Andrena*, *A. gwynana* Kirb. has two broods in the season. The spring-flying adults raised the previous summer hibernate as adults and are more robust with longer coats than the summer flying adults which are raised in the spring and have the slender, feeble appearance of the few species of *Andrena* found in the tropics.

Queens of the Italian bee that have been chilled in the pupa stage have the orange part of the integument darkened, and queens of *Bombus lapidarius* L. that slowly passed the pupa stage in the lowest temperature that could support life, had their black and red coat changed to brown.

How far the fact that British forms have a larger number of close allies on the Pacific Coast than in Eastern Canada is due to migration via Asia and how far to the action of similarity of climate cannot be estimated until our knowledge of Siberian forms, at present meagre, is greatly increased. The hairs clothing the body are of value to the bees for gathering pollen for which they are admirably adapted, being branched but unbranched in wasps. Their value for keeping the insect warm in chilly weather is apparently of secondary importance because wasps are almost as scantily clad in the north as in the south, and the parasitic bees are scantily clad. Bright colours and striking patterns, whether of coat or tegument, for instance in *Bombus* and many parasitic bees and many wasp genera, are usually of the warning kind and therefore are liable to regional convergence. In England, most of the species of *Bombus* have a white or a red tail. In Canada the only white or red-tailed species are in the western mountains and the north.

## CATOCALA ULALUME, A CORRECTION.

BY G. H. FRENCH, CARBONDALE, ILLINOIS.

It may be unfortunate that Mr. Herman Strecker did not figure all of the new species that he described, for his descriptions, like those of some of the rest of us, were not always clearly drawn. Another unfortunate thing, for me, is that during a few years in which I was compelled to drop entomological work some of my material was lost, among which was *C. ulalume*. The specimens upon which were based my note in the Canadian Entomologist of January, 1919, page 16, were Dr. Holland's *C. carolina*, and that is really a variety of *C. flebilis*. This species is too small for *C. ulalume*.

Since writing the above-mentioned note I have seen material from several localities outside of Southern Illinois, containing a number of forms of *C. lacrymosa* and *C. dejecta*. One of these, I think from Kentucky, has the bluish sheen of *C. dejecta*, with no noticeable brown except a narrow subterminal shade of very dark brown, not noticeable except under the lens. This specimen had t. p. dentation of *C. lacrymosa*, but lacks the white along the t. a. and t. p. lines near the posterior margin of the wing that is so prominent in *C. lacrymosa*. The whole wing is pretty evenly dusted with black atoms.

# ON THE MALE AND IMMATURE STATE OF *GRYLLOBLATTA CAMPODEIFORMIS* WALKER.

BY E. M. WALKER, TORONTO.

The remarkable Orthopteroid insect described by the writer as *Grylloblatta campodeiformis*[1] has been hitherto known only from the type and paratype specimens, both of which are mature females. Through the kindness of Dr. C. Gordon Hewitt, Dominion Entomologist, who visited Banff, Alberta, the type locality, in 1916, I have had the privilege of examining seven additional specimens, including a mature male, two mature females and four nymphs, of which three are males and one is a female.

One of the adult females was taken by Dr. Hewitt, in company with Mr. N. B. Sanson, Curator of the Rocky Mountains Park Museum, and is well preserved in alcohol. The other specimens were dried and were found in the collection of the Rocky Mountains Park Museum, with the exception of one male nymph, also dried, from the National Collection. All were taken in the vicinity of Banff, the labels giving the following data:—

"Sulphur Mt., Lab. No. 50, July 18, 1916." (Adult female).

"Sulphur Mt., Oct., 1908, N. B. Sanson." (Adult female).

"Sulphur Mt., Nov. 21, 1910, N. B. Sanson." (Adult male).

"Sulphur Mt., Nov. 21, 1910, N. B. Sanson." (Male nymph, stage A).

"Sulphur Mt., top of trail, on snow, Jan. 24, 1910, N. B. Sanson." (Male nymph, stage B).

"Banff, Nov. 5, 1906, N. B. Sanson." (Male nymph, stage B.)

"Sulphur Mt., trail, Nov. 9, 1915, N. B. Sanson." (Female nymph).

Since the original description of this insect was published several papers by Professor G. C. Crampton have appeared, in which its structure and affinities have been discussed at some length. He has dealt chiefly with the thoracic and cervical sclerites,[2] the antennæ[3] and to some extent with the female genitalia.[4] The latter have been fully investigated by the present writer, and will be described in a paper on the terminal abdominal structures of Orthopteroid insects, which it is expected will appear in the near future.

The present paper will be chiefly confined to a description of the adult male and the immature stages of both sexes, as represented by the material at hand, a full discussion of the phylogenetic relations of *Grylloblatta* being reserved for the future paper just mentioned.

It will be convenient to describe the adult male first, then the immature stages of the male and female, respectively.

## *The Adult Male.*

The adult male measures 16.5 mm. in length, and is similar to the female in every respect, except the terminal abdominal segments and genitalia.

The 8th segment shows no special features, being similar to the 7th and other typical abdominal segments. The 9th segment, on the other hand, is very remarkable. It is of considerable size, larger than that of the female, and about equal in width to the 8th segment. The tergite (Pl. VIII, Fig. 1) is about twice as broad as long, with a slightly and somewhat irregularly arcuate hind

1. Walker, E. M., Can. Ent., 1914, vol. XLVI, pp. 93–99.
2. Crampton, G. C., Ent. News, 1915, vol. 26, pp. 337–350.
3. Crampton, G. C., Can. Ent., 1917, vol. 49, pp. 213–217.
4. Crampton, G. C., Journ. N. Y. Ent. Soc., 1917, vol. 25, pp. 25–237.

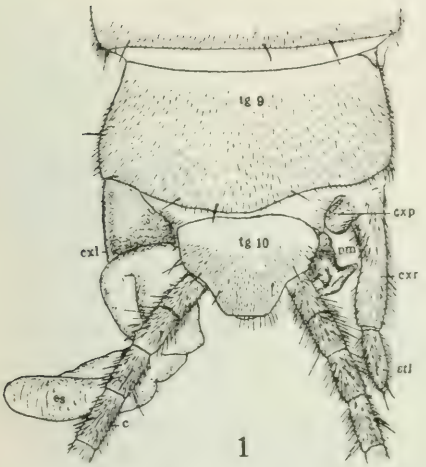
margin, and is nearly if not quite, symmetrical. It is separated from the sternal region only by a suture, there being no distinct pleural membrane (Figs. 8 and 9). The sternal region (Fig. 2) is unique among Orthopteroid insects in being divided into three sclerites, a basal plate, the true "sternite," and two disto-lateral "coxites," which are connected with the sternite by distinct articulations. The sternite is of nearly the same size and form as the tergite, although with a somewhat more decidedly arcuate hind margin and is slightly asymmetrical, being longer on the right side than on the left. The coxites are remarkably asymmetrical and different in form. Both are roughly triangular and bear well-developed styli at their apices. The left coxite (cxl) is a large scoop-shaped plate, whose base extends from the left pleural suture to a point well to the right of the median line. The right coxite (cxr) is of about the same length, but much less than half as broad at base, and is confined to the right side. Its upper margin bears a prominent chitinous process (cxp) directed ento-caudad. Both coxites and styli are thinly pubescent, like the general body-surface, and the styli also bear a few short bristles, chiefly toward the apices.

The 10th segment, as in the female, is much smaller than the 9th, but is fairly prominent. The tergite as viewed from above is symmetrical and trapezoidal in form, being narrowed distally to a truncated apex. Viewed from behind, however, its lateral lobes are seen to be produced mediad beneath the cerci and paraprocts (*laminæ subanales*) into a pair of free, unequally developed arms. The left arm is the longer and is entirely chitinized, except at the tip, which is slightly expanded into a little rounded pad. The right arm is shorter than the left, chitinized only at the base and lacks the pad; having the appearance of an aborted structure. At the base of the cerci, which are similar to those of the female, there is a small ventral basipodite. The supra-anal plate (sa) or "epiproct" is vestigial and feebly chitinized. The paraprocts, which are situated on each side of the anus, are also poorly developed and unchitinized, though pubescent. There is no 10th sternite.

*The Genitalia.*

The phallus is bulky and irregular, resembling in general appearance that of certain Blattidæ, and also recalling that of the Phasmidæ. It consists of two large lobes separated by an oblique fissure, extending from about the mid-ventral line to the left side at the base of the 10th tergite (Figs. 3 and 4). As seen in Fig. 2 both lobes project well behind the posterior margin of the 9th sternite, the right lobe terminating in the space between the two coxites, while the left lies chiefly in the concavity of the left coxite. The right lobe bears upon its dorso-caudal surface a heavily chitinized prominence (pm), divided into two irregularly folded parts, bearing several blunt, tooth-like processes. Just above it are two nearly horizontal plates (1m), whose freely projecting outer (right) extremities are bent backwards towards the chitinous prominence just described. These parts, together with the right coxa, with which they are associated, appear to form the clasping apparatus, in which the left arm of the 10th tergite may perhaps be included. The exposed part of the right lobe is chitinized and pubescent.

The left lobe is entirely membranous except a small, ventral patch, which is chitinized and pubescent. It is remarkable in being produced into a long, coiled membranous tube, which apparently has no opening but is an evaginated

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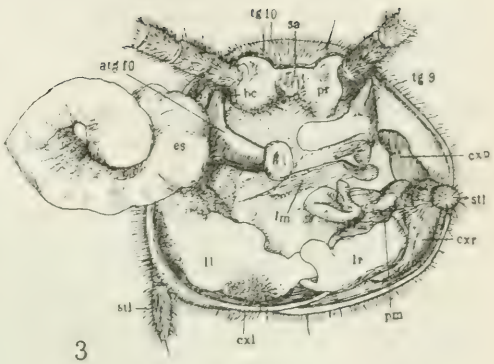


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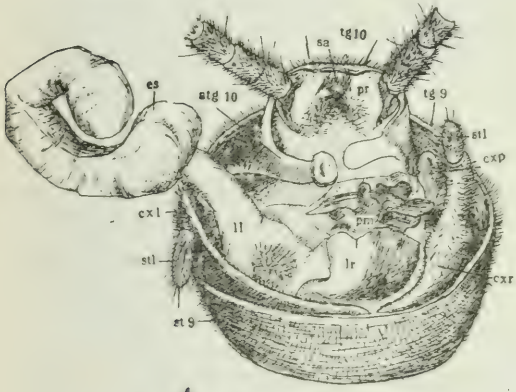


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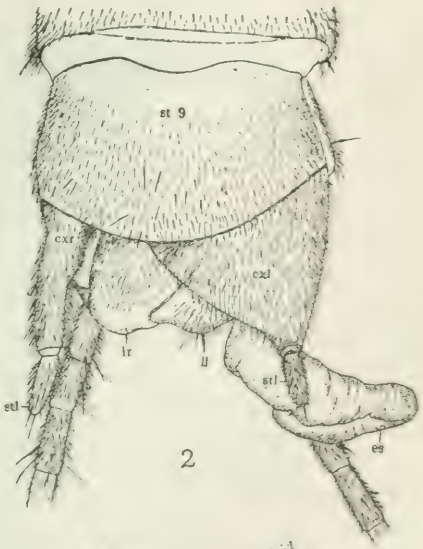


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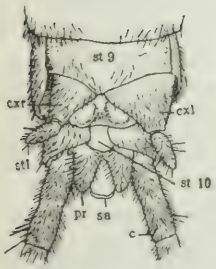


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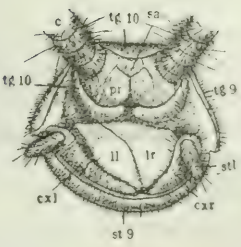


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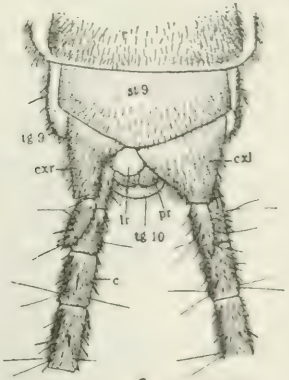


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*GRYLLOBLATTA CAMPODEIFORMIS* WALK.: STRUCTURAL DETAILS. (P. 138.)

sac, comparable to the sheath of the eversible hook, which is present in the same situation in many Blattidæ, sometimes on the right side, sometimes on the left. There is, however, no hook in *Grylloblatta* on the left side, although the toothed prominence on the right side is apparently its homologue. The purpose of the coiled sac is not evident. It seems to be too far from the opening of the ejaculatory duct to serve as an eversible seminal reservoir or a bursa copulatrix, for although I was unable to detect the genital aperture it is extremely probable that it lies in the fissure between the two lobes.

The disto-medial angle of the left lobe is produced into a rounded process, which fits into a fold of the right lobe. Its inner surface is somewhat grooved and lies in the fissure, possibly functioning as a seminal channel. It much resembles the "penis" of Periplaneta, Blaberus and other Blattidæ.

*Probable Copulatory Position.*

In the absence of any actual knowledge of the copulatory position in *Grylloblatta* it is perhaps of little value to speculate as to its nature, but the following suggestion may be of some use as a guide to future observations.

It is probable that the copulatory position is radically different from that of the Blattidæ and Mantidæ, in which, on account of the shortness of the ovipositor, an end-to-end connection is possible. I have a female specimen of *Stagmomantis carolina* with a portion of the male body attached, and it shows that the decurved dorso-caudal margin of the ovipositor is received within the genital cavity of the male, the body of the latter being twisted so that its dorso-ventral axis is perpendicular to that of the female. Such a position would be impossible in an insect with so long an ovipositor as Grylloblatta, and it is, therefore, extremely probable that the copulatory position is more nearly comparable to that which is usual in the Orthoptera and Phasmoidea, i. e., the genitalia of the male are applied to the vulva of the female, the two sexes facing the same direction. This is the more probable in that the genital aperture of the female *Grylloblatta* opens directly on the ventral surface at the base of the ovipositor, not being covered by a subgenital plate.

The scoop-shaped left coxite seems adapted to receive the base of the ovipositor, covering the vulva. This would place the right coxa on the right side in such a position as to receive the lower edge of the right dorsal valve of the ovipositor in the notch between its distal part and the chitinous spur (cxp) on its upper edge, which, from its direction would be on its inner side (Fig. 15). The inner edge of the right ventral valve would then be received between the right coxite and the toothed process of the right lobe of the phallus, or possibly between the latter and the transverse laminæ (1m). This position would also bring the oblique fissure more directly in line with the longitudinal axis of the body of the female, and thus permit a more direct passage for the spermatic fluid or spermatophore into the vagina.

*The Male Nymph.*

The earlier of the two stages represented (stage A) measures 11 mm. in length, the hind tibiæ 2.75 mm. The antennæ, one of which is incomplete, have 22 segments. It is quite similar to the adult in form, except in the somewhat less tapering antennæ, and slightly stouter femora, particularly the profemora, which are nearly half as broad as long, and the terminal abdominal segments and genitalia.

The 9th segment (Fig. 5) is relatively much smaller than in the adult. Its sternal region is clearly divided into sternite and stylus-bearing coxites. The asymmetry is noticeable but far less marked than in the adult, the base of the left coxite being only about 1.5 times as broad as that of the right. Both are ventral in position and triangular in form, with relatively large styli. There is as yet no indication of the spur borne by the right coxite in the adult.

The 10th segment is relatively larger than in the adult and consists chiefly of the tergite, which forms a ring broken only by a small sternal area (st 10). The latter is quite distinct but membranous. There is as yet no distinct appearance of asymmetry in the 10th segment.

In the intersternal membrane between segs. 9 and 10 two slight ventro-lateral raised areas are visible, the rudiments of the two lobes of the phallus (Fig. 10).

The cerci are quite similar to those of the adult except that they are relatively stouter, and the constriction between the first two joints is less clearly defined.

The supra-anal plate and the paraprocts are much more prominent than in the adult, the former being slightly chitinized above, the latter membranous but pubescent.

The two specimens belonging to the older nymphal stage (stage B) measure 11 mm. and 12.5 mm., respectively, the abdomen of the former being contracted. The hind tibiæ in each are about 3.1 mm. long, and measurements of other parts are also closely comparable. The form of the 9th sternum has changed very little from stage A, though the asymmetry of the coxites is a trifle more marked. The principal change is the greater contrast in size between segments 9 and 10. The former is relatively considerably larger, the latter smaller and almost entirely concealed in a direct ventral view (Fig. 6). The ventral edges of the 10th tergite nearly meet one another, there being no longer a distinct 10th sternum. The supra-anal plate and paraprocts are also greatly reduced, almost as much so as in the adult.

Owing to the increased depth of segment 9, the intersegmental membrane on which the phallus develops is now nearly vertical instead of horizontal in position. The two lobes of the phallus (Fig. 7) are much larger, asymmetrical and separated by a fissure having a obliquity similar to that of the adult but less marked. No chitinized areas are as yet present.

The difference in size between these two nymphal stages is so slight that it is almost certain that they represent successive instars.

*The Female Nymph.*

The single immature female is somewhat larger than any of the male nymphs, measuring 15 mm. in length, the hind tibiæ 3.25 mm. The antennæ have 24 to 25 segments. The 8th abdominal sternum is similar to that of the adult, except that it lacks the pale median area present in the latter, and is less firmly chitinized. The ventral valves of the ovipositor or valvulæ (anterior gonapophyses) arise from the hind margin of the 8th sternum and extend back a little beyond the hind margin of seg. 10. They are straight, subcylindrical, broadest at base, and taper to bluntly pointed apices. The basal segments (basivalvulæ) are well marked off by a distinct constriction. The sternal region of seg. 9 is clearly defined and still has its primitive horizontal position, in line with that of seg. 10; whereas in the adult it becomes vertical, so that the bases of the dorsal and inner valvulæ are directly above those of the ventral valvulæ (not including the basivalvulæ).

The dorsal and inner valvulæ (outer and posterior gonapophyses) arise in the same transverse plane across the middle of the sternum. The former are subcylindrical and terminate in well-developed styli like those of the male, which reach just beyond the tips of the paraprocts, and are about half as long as the valvula itself. The apices of the ventral valvulæ reach to about the ends of the dorsal valvulæ, without the styli, and as the dorsal valves in the adult are distinctly longer than the ventral valves, it is evident that the styli are not cast off at ecdysis, but go to form the apices of the dorsal valves.

The inner valvulæ occupy the space between the outer or dorsal pair, and are contiguous with the latter and with each other at base. They are simple, styliform processes, falling a little short of the dorsal valvulæ without the styli.

A comparison between the structure of the immature and mature ovipositor of *Grylloblatta*, and the remaining parts of the 9th sternum will be made in my later paper. It may be mentioned here, however, that the lateral parts of the 9th segment, shown in Fig. 10 (vf) become the small triangular plates which Crampton has termed the "valvifers."

*Concluding Remarks.*

It is not my intention to discuss here in detail the phylogenetic relations of *Grylloblatta*, but attention may be drawn to a few points which have a bearing on the problem.

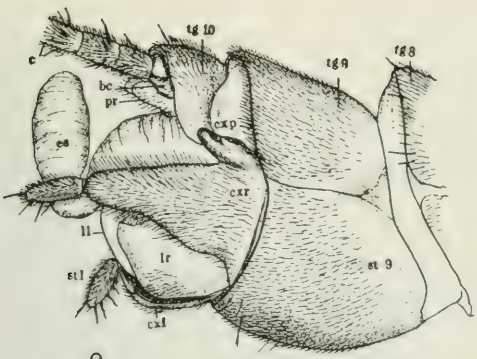
One of the most significant features possessed by the male is the remarkably primitive structure of the 9th abdominal sternum. In no other Pterygote insect, so far as I am aware, is there to be found an abdominal sternum consisting of sternite and separate, undivided coxites, each bearing a simple stylus. In some Ephemerids, such as *Blasturus nebulosus*, the 9th sternum of the male consists of sternite and separate coxites with styli, but either the styli or the apical part of the coxites are secondarily segmented, and even this condition is unusual, as the coxites in the Ephemerida are generally united to form a single plate.

It is in the Thysanura that we find abdominal sterna most nearly comparable to the 9th sternum of the male *Grylloblatta* in respect of the features mentioned. In certain genera of Lepismoidea (*Nicoletia* and *Atelura*) the 9th sternum of the female possesses, in addition to the stylus-bearing coxites (present in both sexes), a sternite overlapping the bases of the coxites.[5] In most of the genera of this order and of the Machiloidea, however, the sternite is absent from the 9th segment, but in the latter group the other abdominal sterna, or most of them, show all these parts, although the coxites are separate from the sternite, and basally from one another, only by sutures.

In this connection it may be added that *Grylloblatta* is interesting as giving additional support, if such be necessary, to the view that the lateral gonapophyses of the female are prolongations of the coxites of segment 9.

Thus in the structure of the 9th sternum of the male, *Grylloblatta* is not only more primitive than any other Orthopteroid insect, but also more so than the Plecoptera, Embiidina and Dermaptera (together constituting the "Panplecoptera" of Crampton) in all of which the division into sternite and coxites, and the styli, have been lost. It is also more primitive than any of the true Orthoptera in the absence of a subgenital plate in the female other than the

5. Escherich, K., Das System der Lepismatiden, Zoologica, 1905, Bd. 18, Heft 43, p. 25.

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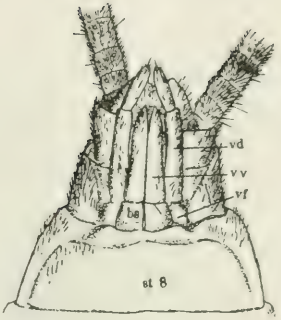


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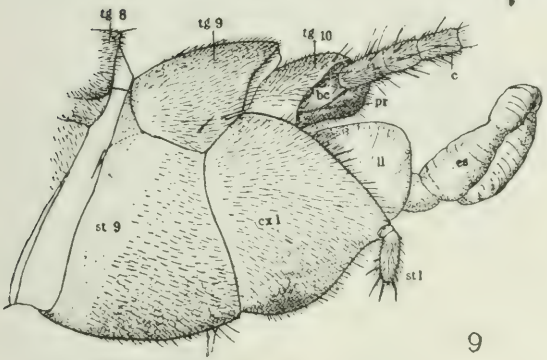


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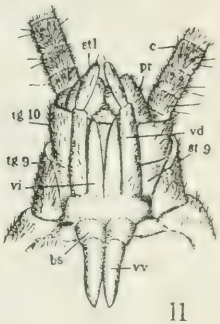


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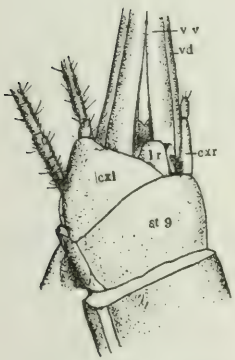


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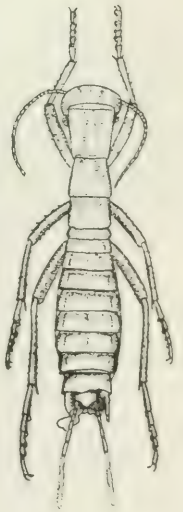

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*GRYLLOBLATTA CAMPODEIFORMIS* WALK.; STRUCTURAL DETAILS. (P. 138.)

unmodified 8th sternum, and in the details of the ovipositor, which are yet to be described. The immature ovipositor is of a distinctly more primitive type than that of the most generalized Orthoptera of corresponding stage, e. g., *Cuthophilus* of the Tettigoniidæ. This is seen in the form and position of the valvulæ, the presence of well-marked styli and the more definite basivalvulæ. In these respects it approaches the Blattidæ and Mantidæ, but the valvulæ of the 9th segment have not the terminal position, nor have the dorsal valvulæ the broad, flattened form found in these groups, in which respects they are apparently the more primitive, at least at this stage. The great reduction or complete loss of the ovipositor in the Panplecoptera is, of course, a secondary feature, in which they are negatively specialized, as compared with the majority of Orthopteroid groups.

The male genitalia considerably resemble those of certain Blattoidea and Mantoidea, and also the Phasmoidea, and the fundamental plan of structure seems to be the same in all of these groups, although I believe the asymmetry has been independently acquired in some of them, at least. The true Orthoptera seem at first sight to be constructed upon an entirely different plan, but further investigation tends to indicate that it is a very highly modified form of the same plan.

It is my present opinion that the "Panisoptera" (Blattoidea, Mantoidea and Isoptera), which is unquestionably a natural assemblage, and the Orthoptera together with the Phasmoidea, represent two main branches of the same stem, originating as a section of the Palaeodictyoptera, and that Grylloblatta is the sole survivor of a twig which separated from this stem before the two main branches had become differentiated. The Phasmoidea also separated very early from the Orthopteran branch. The characters in which Grylloblatta and the Phasmoidea resemble the "Panplecoptera" are all primitive ones, and only indicate the common origin of the two stems.

The five-jointed tarsi, which are present in Grylloblatta, the Blattoidea, Mantoidea and Phasmoidea, are characteristic of primitive Orthopteroid insects, but I agree with Crampton's suggestion that the trimerous type may be, after all, the more primitive for the Class Insecta in general. We never find pentamerous tarsi in the Apterygota, nor in any of the Panplecoptera, so that they were probably acquired very early in the Orthopteroid stock, and probably also in other branches of the Palæodictyoptera. The reduced number of tarsal joints in the Isoptera and true Orthoptera is doubtless a secondary feature.

## Explanation of Plates VIII and IX.

*Abbreviations.*

atg 10—arm of 10th tergite.
bc—basipodite of cercus.
bs—basivalvula.
c—cercus.
cxr, cxl—right and left coxites.
cxp—process of right coxite.
es—eversible sac.
lm—laminæ forming part of clasping apparatus.
lr, ll—right and left lobes of phallus.
pm—chitinous process of right lobe of phallus.
pr—paraproct.
sa—supra-anal plate.
st 9—9th sternite.
tg 9, tg 10—9th and 10th tergites.
vd—dorsal valvula.
vf—valvifer.
vi—inner valvula.
vv—ventral valvula.

Plate VIII.—*Grylloblatta campodeiformis*, terminal abdominal segments and genitalia of male. 1, adult, dorsal view; 2, same, ventral view; 3, same, caudal view; 4, same, ventro-caudal view; 5, nymph, stage A, ventral view; 6, nymph, stage B, ventral view; 7, same, caudal view.

Plate IX.—*Grylloblatta campodeiformis*. 8, adult male, right lateral view of terminal abdominal segments; 9, left lateral view of same; 10, female nymph, ventral view of terminal segments; 11, same with ventral valves bent forward to show inner valves; 12, diagram of probable method of coupling; 13, adult male dorsal view; 14, male nymph, stage A; 15, male nymph, stage B.

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# THE MAY-FLY OVIPOSITOR, WITH NOTES ON *LEPTOPHLEBIA* AND *HAGENULUS*.*

BY EMILY REED MORRISON, WASHINGTON, D.C.

The biological and morphological information contained in this paper was obtained from field trips made at Cornell University in the early summer of 1917, and from a laboratory study of the material thus collected and of related forms in the University collection. The work was undertaken at the suggestion of Dr. J. G. Needham who called the writer's attention to this may-fly and to the unusual structure present on the seventh and eighth abdominal segments of the adult female, and suggested that it might prove an interesting subject for a summer's study, an examination of other related species perhaps revealing similar modifications heretofore unnoted. For this original suggestion and for subsequent additions and corrections to the work, the writer is greatly indebted to him.

This species was first described by Dr. Needham (3) as *Choroterpes betteni* from specimens which had been collected by Dr. Cornelius Betten near Hamburg, N. Y., in 1906. Only adults were available for study at that time, and the species was doubtfully referred to the genus *Choroterpes*. Ten years later Dr. Needham found a swarm of little red may-flies near McLean, New York, which upon examination proved to be the same species; and in the nearby stream were the reddish-brown nymphs which he suspected to be its immature form. An examination of the nymphs showed that they belonged to the genus *Leptophlebia*. The observations and breeding work of the writer confirmed Dr. Needham's opinion that both nymphs and adults were the same species, *Leptophlebia betteni*.

## Habitat.

The local habitat of this species is rather unique. It lies in the midst of a series of peat and grass bogs which are located near McLean, New York. Both the fauna and flora of this region are extremely localized, owing to the peculiar manner of the formation of peat bogs. The water in the streams which run through the peat bogs is of a deep coffee colour. It is in such a coffee-coloured stream which runs from a pond in the midst of the bogs that the nymphs of *Leptophlebia betteni* live, on logs which have dropped into the stream and have become water soaked and partially rotted. The brown nymphs were found in the longitudinal fissures of these logs, and so closely do they resemble the wet wood in colour that it is impossible to distinguish them when they remain motionless. On the logs with them may be found numerous Parnid beetles,

*Contribution from the Entomological Laboratory of Cornell University.
June, 1919

Bryozoans and fresh water sponges, together with the comb-horned fish fly, *Chauliodes;* the green may-fly, *Baetis;* Chironomid larvæ; the stone fly *Perla;* such caddis worms as *Hydropsyche;* and the Hydrophilid beetle, *Hydrobius globosus*. This may-fly is also extremely localized in habitat for the imagos were found for a distance of only about twenty feet and were abundant for only about six feet. The immature forms were found in the stream opposite this place of greatest abundance. At this point the stream bed breaks into gentle riffles in which lives the mollusk, *Anodonta footiana*, in some numbers. Just above the riffles the stream bed changes abruptly to soft, black ooze which is filled with another mollusk, *Sphærium*.

The writer visited the stream on the 25th and 30th of June, hoping to find the may-flies swarming, and if possible to observe mating and oviposition. However, the season had been late and cold and there were no swarms, although the nymphs were transforming; both subimagos and adults were clinging to the herbage and shrubs along the stream. Although no egg masses could be found, there were many of the small brown nymphs on the water-soaked wood, and from some of these which were carried into the laboratory it was possible to rear both sub-imagos and adults.

## Description of the Stages.

### *Egg.*

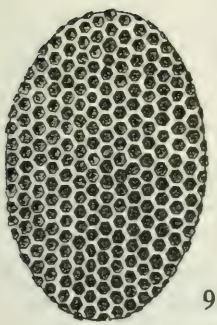
A dissection of the ovaries of a female of this species showed the presence of about six hundred eggs. The following description was made from material thus obtained. The egg (Pl. X, Fig. 9) is broadly ovate, .195 mm. long, by .11 mm. wide. The surface of the egg shell is laid off in numerous minute hexagonal areas with depressed centres. The dissected material was translucent whitish, and it was necessary to stain the shell to bring out the reticulation clearly.

### *Nymph.*

The fully grown nymph (Pl. X, Fig. 8) is 7 mm. long with the three anal setæ 4 mm. long and subequal, and the antennæ 1.7 mm. long. The body is elongate, slender, flat below and slightly convex above. It is widest at the mesothorax, while the prothorax is slightly narrower than the head. The wing pads project posteriorly over the margins of the first two segments of the abdomen. The abdomen is long and narrow, twice as long as the head and thorax combined, widest at the sixth segment and with segments eight and nine produced posteriorly at each lateral margin into a triangular spine, while the caudal margins of segments nine and ten bear a fringe of spines dorsally. The deeply bifurcate abdominal gills are present on the lateral margins of segments one to seven and are all approximately equal in length, with broad basal portion about half as long as each of the slender terminal filaments. The body above is reddish brown in colour and slightly lighter beneath.

### *Mouth Parts of the Nymph.*

The labrum (Pl. X, Fig. 1) is larger than wide and rather deeply incised medially, while on the under surface are a number of fine hairs which aid in straining food particles from the water. The mandibles are very roughly and irregularly triangular in shape, with the articulation and muscle attachment occupying about half of the base and with a group of large, erect fangs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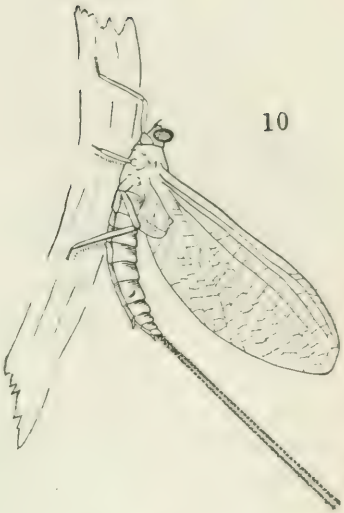
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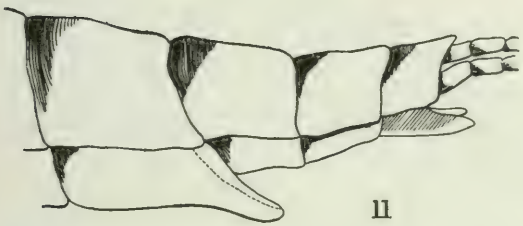
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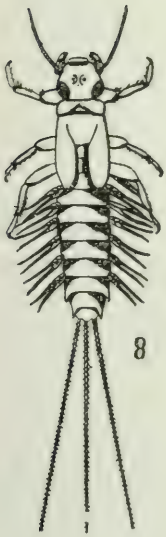
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LEPTOPHLEBIA BETTENI (NEEDHAM) AND L. PRÆPEDITA ETN.?

projecting at right angles to the axis of each mandible near its apex, while just within this group of fangs is the much smaller movable endopodite, terminating in a tiny brush of differentiated long and short hairs. The molar surface of the right mandible (Pl. X, Fig. 4) is situated on the lateral margin, while that of the left mandible (Pl. X, Fig. 3) is on the outer anterior margin. Each maxilla (Pl. X, Fig. 6) is made up of a basal portion, the cardo, which is roughly broad-triangular in shape and apparently divided into two sclerites. A united galea, lacinia and stipes, oblong in shape, more or less constricted in the middle, with apex diagonally truncate and the base rounded off on the inner side, is apparently attached to both sclerites of the cardo. A short suture at the inner apical corner of this combined sclerite marks the only differentiation between the galea and lacinia, while these structures cannot be separated from the stipes. A thick brush of long, fine hairs borders the truncate distal margin of the galea. The four-segmented palpi are attached about midway on the outer margin of this combined sclerite, with the basal segment minute tringular and the remaining segments elongate cylindrical. The second and fourth palpal segments are subequal in length, the third is a little shorter. The apical segment terminates in a cluster of hairs nearly as long as the segment. The labium (Pl. X, Fig. 5) consists of a ligula divided into oval glossæ and much wider paraglossæ, a pair of large, three-segmented labial palps, and a very much reduced and undifferentiated mentum, submentum and palpifer. The glossæ are clothed, except at the base with short, fine hairs, have a row of short, stout spines on the lateral margin, and terminate at the apex in a hook-like spine. The hairs on the distal portion of the paraglossæ are much longer than those on the glossæ. The apical segment of each labial palpus possesses a row of rather stout hairs on its inner margin, while there are finer hairs on the outer margins of the basal segments. The hypopharynx (Pl. X, Fig. 2) which normally lies closely applied to the labium, is divided into a central piece and two large lateral lobes which have long, fine hairs on their distal portions, while there are two short tufts close to the median margin of the central piece.

*Adult.*

(Pl. X, Fig. 10).

Dr. Needham (3) has described the adult as follows:—

"*?Choroterpes betteni*

"Length 5–6 mm.; expanse 10–11 mm.; setæ of the male 5–6 mm., and of the female 4½–5 mm.; colour nearly uniform, dark reddish brown, slightly paler on the middle abdominal segments in the female; wings hyaline, veins pale brown; legs yellowish brown, hind femur with two darker bands, fore femur of the female wholly dark; setæ pale yellowish with brown rings, three in number, equal; forceps of the male pale brownish, darker beneath with one very long basal and two very short apical joints."

*Male Genitalia.*

The male genitalia follow the general plan of structure which is constant in all of the species of *Leptophlebia* which were examined. They (Pl. X, Fig. 13) consist of paired penes placed between the forceps, each limb of which is made up of one long stout, slightly tapering basal segment and two small oval terminal segments, equal in size. The penes form an unjointed lobe-like pro-

tuberance, about half the length of the basal forceps arm, the paired arrangement, which shows distinctly in other species, being indicated only by a deep median cleft. The sperm ducts terminate in a pair of openings at the end of the paired lobes, while from below the middle of each margin there projects upwards and outwards as far as the base of the lobe, an elongate slender structure, slightly clavate near the apex.

So very distinct are these variations in structure that they may be used to separate the species. Thus in *Leptophlebia mollis* (Pl. XI, Fig. 11, 12) the basal portion of the basal forceps segment is decidedly enlarged and there extends from each of the divided penes a distinctly sword-shaped protrusion.. And in a form closely resembling *Leptophlebia præpedita** (Pl. XI, Fig. 13, 14) there is a small, additional segment at the base of each forcep limb, and the penes are long with a proportionately smaller lateral extension.

## The Ovipositor in May-flies.

That a modification of the abdominal segments about the egg-valve, (that is ventrally between segments seven and eight) exists in certain may-flies, has previously to the description of *L. betteni*, been noted apparently by but two other workers. Dr. Hagen (2) seems to have been the first to note the presence of any such modification, for he states (p. 2) "Some of the females have a rounded egg-valve at the antepenultimate abdominal plate;" and again in characterizing the genus *Potamanthus* which included the *Leptophlebia* of modern writers, he states (p. 17) that the egg-valve is long. Dr. Eaton (1) in his Monograph of the Ephemeridæ, (p. 2) makes the following statement:—

"In the female the oviducts terminate separately in the joining of the seventh and eighth segments; there is no real ovipositor, but in some genera (e. g., *Heptagenia*) the apex of the seventh segment is produced into a short, rounded flap, and in one *Hagenulus* this projection takes the form of a spout."

In order to determine if this modification existed in any other forms, the writer made an examination of several species of the genus *Leptophlebia*, of the related genus *Choroterpes*, and the genus *Heptagenia*, all of which had been collected near Ithaca, New York. In *Choroterpes* and *Heptagenia* no trace of such a condition could be found, but in two species of *Leptophlebia* other than *betteni* there was a marked differentiation in the ventral structure of segments seven and eight between which the egg-valve opens. *Leptophlebia mollis* shows the simplest condition in this respect. The ventral portion of segment seven extends backward very slightly, as compared with the other abdominal segments, to form a broad truncated lobe, under which lie the two openings of the oviducts. Plate XI, Fig. 10 shows the ventral aspect of the abdomen at this point. In the centre of segment seven are two prominent conjoined ganglia (*n*) on either side of which lies an oviduct (*o*) filled with eggs, opening beneath the lobe. The modification of segment eight consists of two rounded chitinous ridges, converging posteriorly, covered with small

*"This is the *Leptophlebia præpedita* (?) Etn. of Needham's 'May-flies and Midges of New York" (N. Y. State Mus. Bull. 86, pp. 49-51, 1904, Pl. 11, Fig. 1, 2) and the nymph is there described. The gills lack the basal tracheal stubs that are shown in both the forms figured in this paper."—J. G. N.

spinules, with a concave area between the ridges, placed on the anterior third of the segment and extending nearly to the truncate lobe of the seventh segment. In *Leptophlebia submarginata* these last mentioned ridges are closer together and shorter and completely covered by a mid-ventral triangular prolongation of the apex of segment seven.

In *Leptophlebia præpedita* (?) (Pl. X, Fig. 11) the posterior portion of the seventh abdominal sternite is still more elongated, extending outward and backward so as to be distinctly visible from the side. Segment eight is but slightly modified. *Leptophlebia betteni* shows a further specialization in which both segments seven and eight are conspicuously involved (Pl. X, Fig. 12). The greatest development occurs in segment eight, the expanded portion of which is extended ventrally into a long and narrow, distinctly ovipositor-like organ the tip of which is quite heavily chitinized and basally into a short egg guide. A backward prolongation of segment seven forms with segment eight a channel for the passage of the eggs. An internal dissection showed that the oviducts, extend to the egg-valve and open separately at its base. One species of *Hagenulus*, which is found in Cuba has a much longer ovipositor-like extension (Pl. XI, Fig. 8) than has *Leptophlebia betteni*. A female specimen of this form, which is in the Museum of Comparative Zoology at Cambridge, Mass., was kindly loaned by Dr. Nathan Banks, and upon examination it was found that segment seven extends beyond the apex of the abdomen, folding together toward the tip in a tubular form with an opening on the upper surface. Three chitinous ridges extend along the under surface, converging to the tip. The oviducts extend and open separately, the eggs passing into the ovipositor in two strings whose identity is lost as they pass out of the aperture in a cylinder.

No nymphs of the genus Hagenulus have hitherto been made known; but a specimen collected by Professor C. F. Baker in Cuba and sent to Dr. Needham, in whose slide collection it now appears, dissected and mounted, has enabled the writer to present herewith Figures 1 to 7 of Plate XI. Noteworthy are the inequilateral gills, the form of both labial and maxillary palpi, and most remarkable of all, the extraordinary lateral extension of the labium, its breadth greatly exceeding that of the head.

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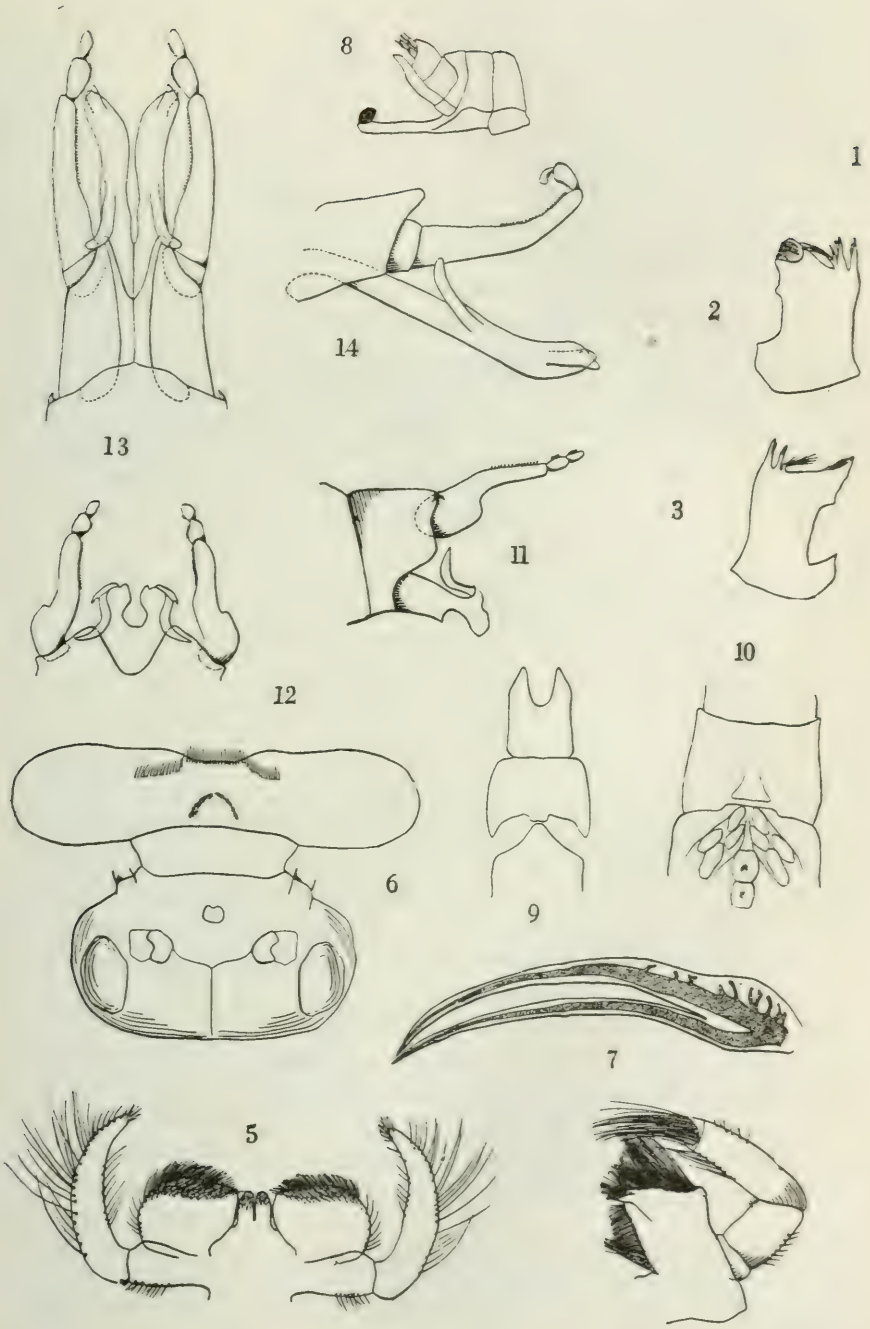


HAGENULUS AND LEPTOPHLEBIA; STRUCTURAL DETAILS.

## Explanation of Plates.

### Plate X.

*Leptophlebia betteni.*

Figure 1. Labrum of nymph.
" 2. Hypopharynx of nymph.
" 3. Left mandible of nymph.
" 4. Right mandible of nymph.
" 5. Labium of nymph.
" 6. Maxilla of nymph.
" 7. Abdominal gill of nymph.
" 8. Fully grown nymph.
" 9. Egg.
" 10. Adult female.

*Leptophlebia præpedita* (?).

" 11. Lateral view of end of abdomen of female.

*Leptophlebia betteni.*

" 12. Lateral view of end of abdomen of female, showing an egg partly extruded between the prolongations of segments 7 and 8.

### Plate XI.

*Hagenulus* sp.

Figure 1. Hypopharynx of nymph.
" 2. Right mandible of nymph.
" 3. Left mandible of nymph.
" 4. Maxilla of nymph.
" 5. Labium of nymph.
" 6. Head and labium of nymph.
" 7. Inequilateral abdominal gill of nymph.

*Hagenulus caligiatus.*

" 8. Lateral view of end of abdomen of adult female, showing ovipositor bearing extruded egg-mass at its tip.

*Leptophlebia submarginata* (European).

" 9. Ventral view of segments 7, 8 and 9 of female, 7 and 8 being slightly separated to show prolongations that form the egg-guide.

*Leptophlebia mollis.*

" 10. Ventral view of segments 7 and 8 of adult female.
" 11. Lateral view of male abdominal appendages.
" 12. Dorsal view of male abdominal appendages.

*Leptophlebia præpedita* (?).

" 13. Dorsal view of male abdominal appendages.
" 14. Lateral view of male abdominal appendages.

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## DELPHACIDÆ OF THE BRITISH MUSEUM—ERRATUM.

On p. 7, line 16, for "3, Pundaluoya simplex Dist." read "3, Pundaluoya simplicia Dist."

F. Muir.

# THE PROPLEURA AND THE PRONOTAL SULCI OF THE ORTHOPTERA.

BY E. MELVILLE DUPORTE, MACDONALD COLLEGE (MCGILL UNIVERSITY).

A few months ago while studying the musculature of *Gryllus pennsylvanicus*, I was impressed by the evident homology of the muscles of the meso- and metapleura with those attached to what I then thought was simply an entopleural apodeme of the prothorax. It occurred to me that this process might really represent the propleuron which externally is limited to a small triangular sclerite in front of the coxa. Examination of other Orthoptera convinced me of the correctness of this view. Recently Crampton* has shown that in *Dissosteira carolina* the pleural region is not "crowded out" but overgrown by the pronotum. This is the first published observation on this peculiar condition in the Orthoptera, and it has induced me to collect and publish my own notes on the subject.

I was pleased that Dr. Crampton in his paper drew attention to the misapplication of the terms *prescutum*, *scutum*, *scutellum* and *postscutellum*, in reference to the areas of the pronotum cut off by the sulci. Since it is generally accepted that the sclerites of the meso- and metathorax to which these terms are applied developed as a consequence of the growth of wings on these segments, and since there is no evidence that the prothorax has ever borne wings it is evident that the pronotal areas cannot be homologous with those of the hinder segments.

I hope to show that the overgrown pleuron is general throughout the Orthoptera (*sens. str.*), and that the sulci of the pronotum are integumental folds which originated as the result of mechanical stress.

## a. The Propleuron.

### *The Acridiidæ* (Pl. XII, Figs. 1–3, 12).

**Rhomalea microptera.** (Figs. 1 and 2). Externally the episternum is visible as a small, triangular sclerite (Fig. 1, est.) protruding from beneath the anterior half of the ventral edge of the pronotum. The position of the overgrown region of episternum is indicated externally by a darker pigmented and more densely punctate area on the pronotum in front of the third sulcus, and its anterior edge is outlined by a lightly impressed dotted line (Fig. 1). The pronotum can be lifted and cut away from the episternum without difficulty as the two are not very closely united. From within the episternum appears as a triangular sclerite with a convex anterior edge. It extends dorsad nearly half way up the pronotum. Its posterior edge lies against the third sulcus and is inflexed, uniting with the similarly inflexed anterior edge of the epimeron to form the entopleurite (Fig. 2, entp.), a triangular ridge which at its apex near the ventral edge fuses with entosternite or furca. A similar entopleural ridge is formed in the meso- and metathorax of this and other orthopterous insects (cf. Fig. 13, entp. 2).

The *epimeron* (Figs. 1 and 2, epm.) is a very narrow sclerite hardly visible externally except at its junction with the episternum. Its position, like that of the episternum, is indicated externally by a more densely punctate area at

*Crampton, G. C., The Thoracic Sclerites of the Grasshopper, *Dissosteira carolina*, Ann. Ent. Soc. Am., vol. XI, p. 347, Dec., 1918.

the ventral edge of the pronotum. It tapers posteriorly to a point which is attached near the posterior ventral angle of the pronotum.

Much the same conditions are found in the other Acridiidæ examined, viz., *Melanoplus*, *Dissosteira*, (Fig. 3) *Stenobothrus*, *Chortophaga*, *Camnula* and *Acridium*.

*The Tettigidæ.* (Figs. 4 and 5).

**Tettix granulatus.** A notch in the edge of the pronotum exposes a very small portion of the ventral edge of the episternum (Fig. 4, est). Internally the appearance is similar to that of the Acridiidæ. The episternum narrows more abruptly and the epimeron is shorter and more narrowed posteriorly. The entopleurite is thin and quite deep. The entosternal arch (Fig. 5, ents.) fuses with the entopleurite near its dorsal end and not, as in the Acridiidæ, near the ventral end.

*The Locustidæ.* (Figs. 6, 7 and 8).

**Conocephalus** (Fig. 6). Externally a very small, triangular portion of the episternum may be seen lying cephalo-laterad of the coxa. The greater portion of this sclerite, however, lies on the inner side of the pronotum extending more than half way towards the dorsal median line. The anterior edge is inflexed slightly and almost parallel with the posterior edge; the dorsal edge is rounded. The entopleural ridge projects ventrally and articulates with the coxa. At the dorsal end of the pleuron the epimeron is represented by a very small, narrow sclerite. At the ventral end there is a short, narrow, rod-like sclerite projecting backwards in much the same position as the epimeron in the Acridiidæ but very much more reduced.

The pleural regions of *Xiphidium* are very similar to those of *Conocephalus*.

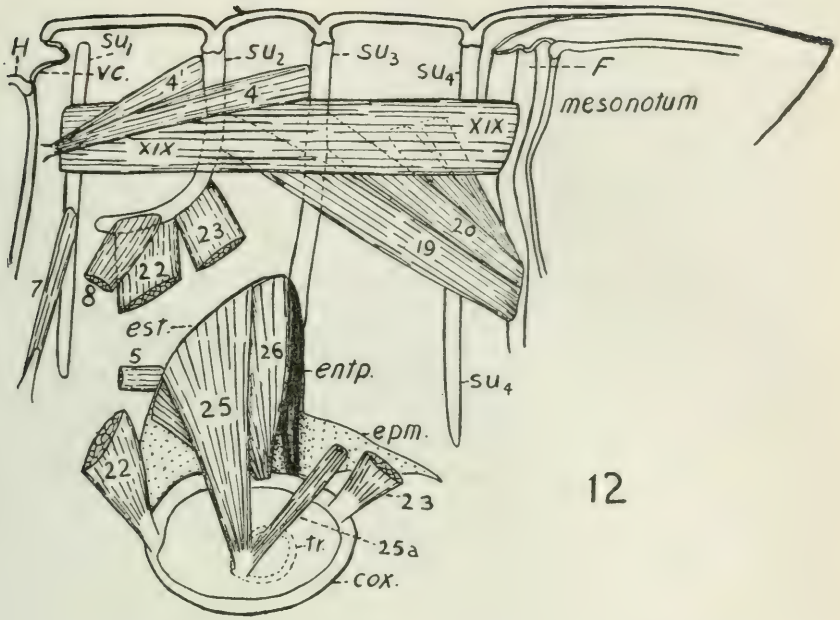
**Microcentrum** (Fig. 7). Here the episternum is triangular, tapering dorsally. The epimeron is very narrow and, as a free sclerite, is confined to the dorsal half of the pleuron. It projects dorsally some distance beyond the episternum.

**Ceuthophilus maculatus** (Fig. 8). The episternum is broad and deeply bilobed. The entopleural ridge is strong and curved; the epimeron is very narrow, widest at the dorsal end and extending almost to the ventral edge of the pronotum.

*The Gryllidæ.* (Figs. 9, 10, 11).

**Gryllus pennsylvanicus** (Figs. 9 and 10). The pleuron extends dorsad almost to the median line. It is irregular in shape, and as it follows the curve of the pronotum is itself pronouncedly curved. The episternum is narrow but well developed, and the ventral edge projects slightly below the pronotal edge. The entopleural ridge is deep and projects ventrally, articulating with the coxa by a ball and socket joint. The epimeron is narrow and is best developed dorsally. It does not descend as far as the ventral edge of the pronotum.

**Œcanthus nigricornis** (Fig. 11). In Œcanthus the pleuron is completely overgrown by the pronotum. The anterior ventral angle projects slightly beyond the membranous integument (shown by the dotted line) connecting the pronotum and the sternal sclerites, so this small portion of the episternum can be seen on the ventral side beneath the flange-like edge of the pronotum. The episternum is broadly oblong. The entopleural ridge is narrow and but

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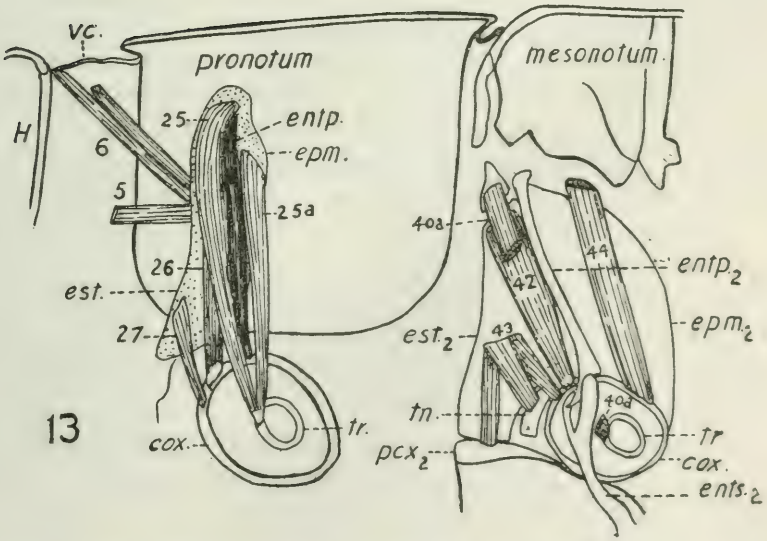



13

PROPLEURAL AND PRONOTAL SULCI OF ORTHOPTERA.

(Page 153.)

slightly raised; as in the Locustids and in the other Gryllids it projects ventrally and articulates with the coxa. The epimeron is very narrow, almost as deep as the episternum and practically uniform in width except at the ventral end, where it projects farther caudad. It is entirely an internal sclerite.

In the insects described it is possible to trace a distinct gradation in the development of the propleura as ental sclerites. In the Acridiidæ (Figs. 1–3) the ventral end of the pleuron had undergone but little change and still stretches from the anterior to the posterior end of the prothorax. The epimeron is greatly reduced dorsally, much more so than the episternum. It is possible to lift the edge of the pronotum and show that the episternum is a continuous sclerite overgrown by the pronotum. In the Tettigidæ (Figs. 4, 5) the epimeron is still further reduced. In the Locustidæ (Figs. 6–8) the ventral end of the epimeron no longer extends to the posterior end of the segment but is gradually disappearing, the last vestige of it remaining in the Conocephalinæ (Fig. 6). After this we find the epimeron reduced to a very narrow sclerite, best developed dorsally. In *Ceuthophilus* (Fig. 8), except for the broad anterior lobe the pleuron closely resembles that of the Gryllidæ (Figs. 9 and 10). In the Locustidæ and Gryllidæ, unlike the Acridiidæ, the episternum is fused with the ventral edge of the pronotum and (at least in the Gryllidæ) have only a muscular attachment with the inner face of the pronotum, so that the internal portion of the pleuron has the appearance of a process of the small externally visible portion of the episternum; only by comparison with the Acridiidæ, and by a study of their musculature in comparison with that of the hinder segments of the thorax can their true nature be definitely ascertained.

*The Musculature of the Propleuron.* (Figs. 12 and 13).

The reason why the propleuron has persisted in spite of the fact that its position and function as an external lateral wall of the prothorax has been usurped by the overgrowing tergite, probably lies in the fact that important muscles of the leg arise from its inner surface. As fewer of these muscles arise from the epimeron this sclerite is accordingly more reduced than the episternum.

If we examine the mesopleuron of *Gryllus* (Fig. 13) we find the following muscles arising from the episternum.

40a. *From* the basalar sclerite, a detached portion of the episternum, *into* the anterior edge of the trochanter. An extensor of the femur.

42. *From* the dorsal edge of the episternum *into* the anterior edge of the coxa. An extensor of the coxa.

43. *From* near the middle of the sclerite *into*, (1) the precoxale, (2) the trochantin, and (3) the anterior edge of the coxa. An extensor of the coxa.

The pro-episterum of *Rhomalea* and *Gryllus* (Figs. 12 and 13) show homologues of these muscles as follows:—

25, homologue of 40a; 26, homologue of 42, and 27, homologue of 43.

From the procpimeron a single muscle 25a originates. It is inserted into the anterior edge of the trochanter. I have not yet found its homologue in the hinder segments.

A similar homology exists between the muscles of the propleuron and those of the metapleuron.

### b. The Sulci.

**Rhomalea microptera** (Figs. 1, 2 and 12), having four well developed pronotal sulci gives good material for a study of these structures. The first sulcus ($su_1$) lies a very short distance behind the anterior edge of the pronotum and does not quite extend either to the median carina or to the ventral edge of the pronotum. The three other sulci all cut the median carina; the second ($su_2$) runs about half way down the pronotum and curves forward; the third extends to the ventral edge, and its lower half is coincident with the entopleural ridge formed by the infolding of the contiguous edges of the episternum and epimeron; the fourth runs from the median carina almost to the postero-ventral angle of the pronotum. An examination of Figure 12 will show that the first sulcus lies near the line where the infolded integumental membrane of the anterior end of the pronotum merges into the cervical membrane, and marks the furthest point to which the head may be retracted within the prothorax. This sulcus may be regarded then as marking the extremity of the primitive prothorax, the portion of the pronotum in front of this being probably a later developed growth forming a flange to receive and protect the retracted head. The anterior sulcus represents the fold which would naturally be formed when this flanking piece is pushed back by the retracted head. That this is the case is shown in *Tettix granulatus* (Fig. 5) where the prosternum has grown forward, completing the flange formed by the pronotum. In this insect the anterior notal sulcus is continuous with a sternal sulcus (s.su) which marks the position of the anterior end of the sternum in other Orthoptera.

A similar explanation accounts for the origin of the fourth sulcus ($su_4$).

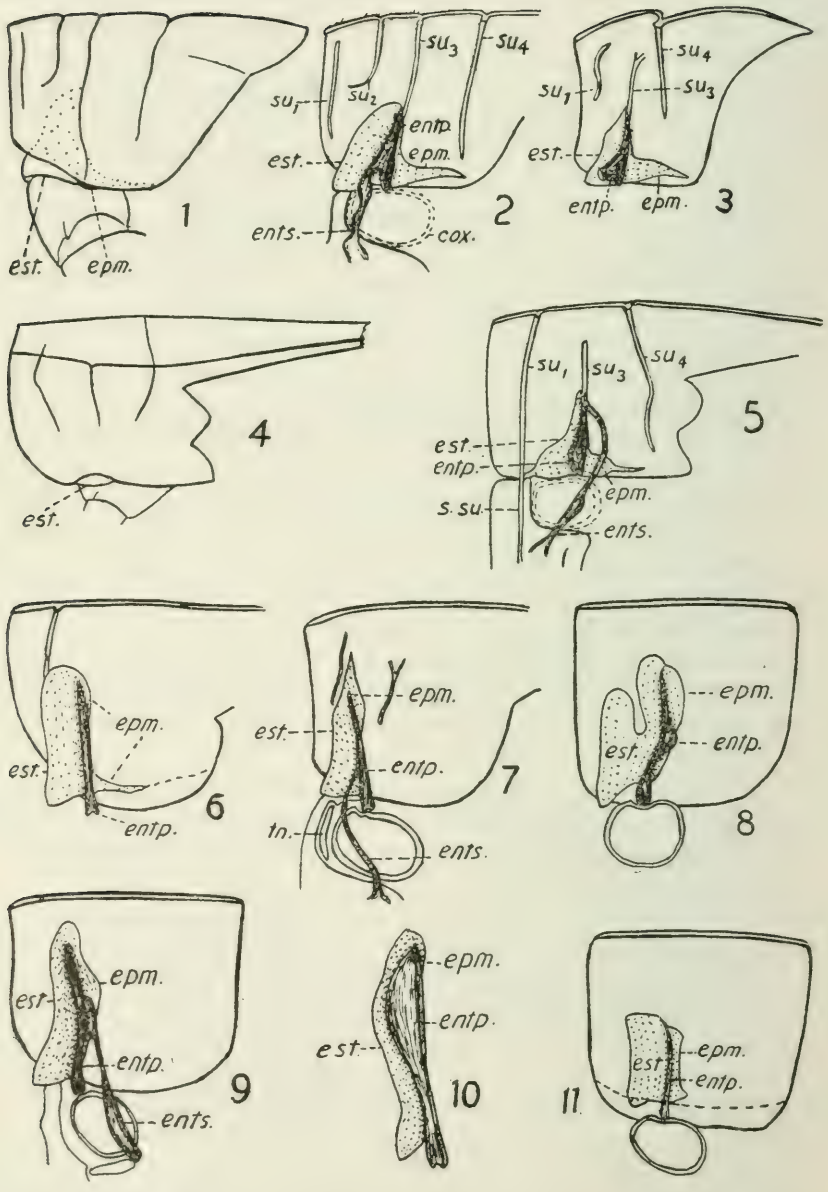
As Crampton (l.c.) has pointed out, the third sulcus originated with the infolding of the contiguous edges of the pleural sclerites to which it is closely attached. This accounts for the origin of the lateral portion of the sulcus, and it will be noted that in *Dissosteira* and many other insects this sulcus does not extend to the dorsal portion of the pronotum. The dorsal portion of this sulcus in *Rhomalea* arose as a result of the pull of the muscles which are attached to it, viz., one head of the third pronotal muscle (20) and one of the elevator of the head (4).

The origin of the second sulcus ($su_2$) is also due to the pull given the integument by the muscles attached to it. These muscles are an elevator of the head (4), a rotator of the head (8), one head of the third pronotal muscle (19), and an extensor of the coxa (23).

At the time the sulci were formed the integument was probably more flexible and less highly chitinized than it is at present. The method of origin of the second sulcus is well illustrated in the condition which now obtains in the flexible sutural membrane between the pro- and mesonotum. Here the pull of the first (XIX) and third (19, 20) pronotal muscles has produced a distinct fold in the integument (Fig. 12 F.). The hardening of this membrane would undoubtedly produce a sulcus exactly similar to those of the pronotum.

### Summary.

1. The propleuron in the Orthoptera has not been forced out by the downgrowing notum, but has persisted on the inner side of the pronotum which has grown over it.




PROPLEURAL AND PRONOTAL SULCI OF ORTHOPTERA.

(Page 153.)

2. The episternum, epimeron and entopleural ridge can be easily distinguished though in most cases greatly modified.

3. The pleural sclerites have probably persisted because of their muscular attachments.

4. The musculature of the propleuron is similar to that of the mesopleuron and metapleuron.

5. The sulci are integumental folds formed by mechanical stress due to (a) the pulling of the head and mesothorax against the pronotum, (b) the in folding of the pleural suture, and (c) the pull of the prothoracic muscles attached to them.

Reference Lettering.

| | |
|---|---|
| cox. | coxa. |
| epm. | epimeron. |
| entp. | entopleurite. |
| ents. | entosternite. |
| est. | episternum. |
| F. | fold in sutural membrane. |
| H. | base of head. |
| pcx. | precoxale. |
| s. su. | sternal sulcus. |
| su. | sulcus. |
| tn. | trochantin. |
| tr. | trochanter. |
| vc. | veracervix. |

*Muscles.*

4. Elevator of head.
5. Retractor of head.
6, 7, 8. Rotators of head.
19, 20, XIX. Retractors of the pronotum.
22, 26, 27, 42, 43. Extensors of the coxa.
23. Flexor of the coxa.
25, 25a, 40a. Extensors of the femur.
44. Depressor of the wing.

Explanation of Figures.

Fig. 1. External view of the pronotum and propleuron of *Rhomalea microptera*.
" 2. Internal view of same.
" 3. Internal view of pronotum and propleuron of *Dissosteira carolina*.
" 4. External view of pronotum and propleuron of *Tettix granulatus*.
" 5. Internal view of same.
" 6. Internal view of pronotum and propleuron of *Conocephalus*.
" 7. Same of *Microcentrum*.
" 8. Same of *Ceuthophilus maculatus*.
" 9. Same of *Gryllus pennsylvanicus*.
" 10. Anterior view of detached propleuron of *G. pennsylvanicus*.
" 11. Internal view of pronotum and propleuron of *Oecanthus nigricornis*.
" 12. Musculature of the propleuron and pronotal sulci of *Rhomalea microptera*.
" 13. Musculature of pro- and mesopleuron of *Gryllus pennsylvanicus*.

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**Change of Name.**—Prof. R. W. Dawson, of Lincoln, Neb., who is making a special study of the genus *Serica* informs me that my *Serica carinata* (Coleoptera of Indiana, 1910, p. 950) is preoccupied by *Serica carinata* Burmeister (Handbuch IV, 2, p. 175). I, therefore, propose for my Indiana species the name *Serica evidens*, sp. nov.

W. S. Blatchley.

# NORTH AMERICAN SARCOPHAGIDÆ: FLIES OF GENUS METOPOSARCOPHAGA TOWNSEND.*

BY R. R. PARKER, BOZEMAN, MONT.

The writer described the species *Sarcophaga pachyprocta* in 1916 (Jour. N. Y. Ent. Soc., vol. 24, pp. 171–175). In connection with the description it was noted that the species was considered to represent a form separable from *Sarcophaga* and possibly should be placed in a distinct genus, but the writer refrained from so doing till it was possible to examine other closely related species. In 1917, however, Townsend made this species the genotype of *Metoposarcophaga* (Proc. Biol. Soc. Wash., vol. 30, pp. 46) but mentioned no other species as belonging to the genus. In the same paper (p. 43) *Sarcophaga incurva* Aldrich was made the genotype of *Thelyleptococnema*. It is the writer's opinion, however, that the two species are congeneric and *Metoposarcophaga* is hereby designated as the name of the genus. *M. tothilli* and *M. pachyproctosa*, new species of the genus, are described in this paper.

The following characters are common to the males of all four species:—parafrontals and genæ silvery grey; front broad, very prominent in profile; vestiture of back of head black or with some light coloured hair close to foramen (in *pachyprocta*); lateral verticals present, greater ocellars as strong or stronger than uppermost pair of frontals; frontal bristles not numerous (six to seven, sometimes eight or nine); epaulet dark; anterior acrostichals well developed; scutellar apicals absent or weak and hair-like; lower sternopleura with bristles only; vestiture of nota of short reclinate bristles that become longer and more slender ventrally; vestiture of fourth ventral plate erect; posterior surface of anterior tibia with two bristles about one-third from distal end (only one in *Sarcophaga* and *Ravinia*); first genital segment much larger than second and its vestiture longer; marginal bristles absent; forceps slender, bent so that prongs are at a pronounced angle to the base; accessory plate at side of forceps (not anterior to them as in Ravinia, etc.), erect and hiding at least part of base of forceps (in *tothilli* and *incurva* only tip of forceps visible from side); claspers on each side united basally (not separate as in Ravinia, etc.); posterior clasper with variously shaped expanded base with bristle at upper anterior angle, distally with a curved hook.

The genus quite naturally divides into two groups, the *pachyprocta* group, containing *pachyprocta* and *pachyproctosa*, and the *incurva* group containing *incurva* and *tothilli*.

The *pachyprocta* group is distinguished by the following characters:—three pairs posterior dorsocentrals; scutellar apicals absent; first vein bristly; costal spine present; posterior tibiæ of normal length; ventrally sides of fourth notum with marginal bristles only; profile of genital segments as in Fig. 1; first genital segment grey pollinose. The penes and claspers very similar but not alike, forceps essentially the same.

Characters of *incurva* group:—four pairs posterior dorsocentrals (sometimes five); scutellar apicals, if present, weak and hair-like; only third vein bristly; costal spine vestigial; posterior tibia much shorter than femur or tarsus; ventrally sides of fourth notum clothed with long, slender bristles; profile of

*Contribution from the Entomological Laboratory of the Montana State College, Bozeman, Mont.

June, 1919

genital segments as in figure 2; first genital segment dull orange, darkened anteriorly; claspers and forceps are essentially alike in both species.

Examination of the figures shows that there is a fundamental likeness in the structure of the accessory genital parts of all four species.

TABLE OF SPECIES.

1. Four or more posterior dorsocentrals, posterior tibia very short.....2.
   Three posterior dorsocentrals, posterior tibia of normal length.....3.
2. Posterior femur normal, tibia short, but not distorted .....*tothilli*, n. sp.
   Posterior femur very large with protuberance beneath bearing a "brush," tibia short and distorted.....*incurva* Aldrich.
3. Anterior clasper reversed S-shaped, penis on long, slender base.....*pachyproctosa*, n. sp.
   Anterior clasper with distal hook and large expanded base, penis on short base.....*pachyprocta* (R. Parker).

**Metoposarcophaga tothilli**, n. sp.

*Holotype* (male).—Collection of R. R. Parker.

*Male.*—Parafrontals and genæ silvery grey; vestiture of back of head black except for some light coloured hairs just below foramen (difficult to see); lateral verticals present, greater ocellars well developed, section III of costa about equal to section X; leg vestiture short; anterior face of posterior femur with only upper row of bristles complete; posterior tibiæ very short, much shorter than either femur or tarsus; anterior acrostichals present; four pairs posterior dorsocentrals (sometimes five); genital segments dull orange except that first is darkened anteriorly.

Length 6–10 mm.

Head viewed from side parafrontals and genæ with dark reflections; transverse impression same colour as genæ. Breadth of front at narrowest part about three-fifths eye width; cheek height approximately three-sevenths that of eye. Front very prominent; width of frontal vitta variable but at narrowest part of front at least twice width of each parafrontal. Second antennal segment dark; third about twice length of second; arista short plumose about to middle. Vestiture of back of head black. Gena with scattering hairs above, below with a row close to lower eye orbit.

*Chætotaxy.*—Lateral verticals present; vibrissæ inserted slightly above line of oral margin; greater ocellars well developed; frontal rows of bristles extending to or slightly below base of vitta, the lower few pairs divergent from edges of vitta.

*Thorax.*—Vestiture of mesonotum black, cilia-like, slightly reclinate.

*Wings.*—Anterior cross-vein more basal than end of first longitudinal; third vein bristly; costal spine vestigial; section III of costa practically equal to section V; calypters whitish, fringed with white hair.

*Legs.*—Dark, vestiture short. Anterior face of posterior femur with complete upper row of bristles, intermediate row absent, lower row with a few rather weak distal bristles; tibia very short, beardless, about three-fourths length of femur, much shorter than tarsus, middle femur without "comb."

*Chætotaxy.*—Well developed. Anterior acrostichals present; inner presuturals absent; four pairs posterior dorsocentrals (sometimes five); prescutellar

acrostichals present; scutellar apicals absent or scarcely differentiated; three sternopleurals; lower sternopleura with bristles only.

*Abdomen.*—Rather short. Clothed above with short, reclinate bristles, beneath with longer, more erect hair; on each side ventral portion of fourth notum clothed with long, slender bristles (not confined to edge as in most species of *Sarcophaga*); ventral plates not rounded posteriorly, fourth clothed with erect hair.

*Chætotaxy.*—Second segment without marginal bristles or, if present, short, decumbent and inconspicuous; third with two, sometimes very weak; fourth with complete marginal row.

*Genital Segments.*—Both dull orange except that first is darkened anteriorly. First much the larger, marginal bristles absent: second, flattened, vestiture shorter than that of first; anal area small. Forceps slender, abruptly curved

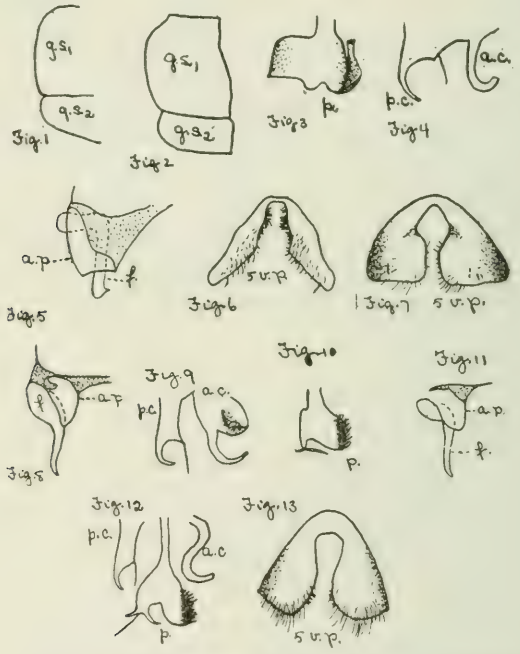


Fig. 22.—*Metoposarcophaga* spp., male genitalia. (Page 157.)

at right angles to the basal portion, distal end slightly enlarged with a short tooth directed forward; forceps in profile view except tip concealed by accessory plate. Penis and accessory parts almost identical with those of *M. incurva* Aldrich.

Described from nine male specimens.

*Range.*—British Columbia; Savary Island, July 13, 18, 20, 31, 1917, (R. S. Sherman, collector). Holotype taken in same locality and by same collector on July 18, 1917.

The writer has two females which are obviously either *M. incurva* or *M. tothilli* and though the posterior tibia is shorter than the tarsus, it is not as short as in the males of these species nor does it present the peculiar structural modifications found in *M. incurva*.

**Metoposarcophaga pachyproctosa,** n. sp.

*Holotype* (male).—Collection of R. R. Parker.

*Allotype* (female).—Collection of R. R. Parker.

This species is so close to *M. pachyprocta* that a repetition of the description is unnecessary. So far as observed the only reliable differences between the males of the two species are to be found in the characters of the genitalia as here listed.

*M. pachyproctosa.*

1. Anterior clasper reversed S-shaped (Fig. 12).
2. Penis distinctive, but with long, slender base (Fig. 12).
3. Fifth ventral plate distinctive (Fig. 13).

*M. pachyprocta.*

1. Anterior clasper with broad expanded basal portion (Fig. 9).
2. Penis distinctive, with short base (Fig. 10).
3. Fifth ventral plate distinctive (Fig. 7).

In addition the second genital segment of *pachyproctosa* is dull orange throughout, and there is a narrow, posterior, dull orange band on the first segment, whereas in *pachyprocta* the second segment is more or less greyish pollinose and the grey pollen of the first segment extends to the middle portion of the posterior margin, at least. These characters may well be variable, however.

I have three females collected in the same locality as the above males. These females are not separable from those of *pachyprocta*, but this species has never been found in several lots of materal from Savary Island. The females are therefore assumed to be those of *pachyproctosa*.

Described from two male and three female specimens.

*Range.*—British Columbia; Savary Island, July 9, and Aug. 11, 1916. July 11 and 12, 1917, (R. S. Sherman, collector).

*M. pachyprocta* is known to occur in Mass., N. Y., N. J., Pa., Va., N. C., S. C., Ga., La., Ind., Ohio, Col., S. D., Calif., Manitoba, Cuba (?) and Hayti (?): *M. pachyproctosa* and *M. tothilli* are known only from British Columbia: *M. incurva* occurs in N. Mex., Mont., and British Columbia.

Explanation of Figures.

1. Profile view of genital segments of *M. pachyprocta* R. Parker and *M. pachyproctosa*, n. sp.
2. Profile view of genital segments of *M. incurva* Aldrich and *M. tothilli*, n. sp.
3. Penis of *M. tothilli*.
4. Claspers of *M. tothilli*.
5. Forceps and accessory plate of *M. tothilli*.
6. Fifth ventral plate of *M. tothilli*.
7. Fifth ventral plate of *M. pachyprocta*.
8. Forceps and accessory plate of *M. pachyprocta*.
9. Claspers of *M. pachyprocta*.
10. Penis of *M. pachyprocta*.
11. Forceps and accessory plate of *M. pachyproctosa*.
12. Claspers and penis of *M. pachyproctosa*.
13. Fifth ventral plate of *M. pachyproctosa*.

ABBREVIATIONS.

a. c. anterior clasper.
p. c. posterior clasper.
a. p. accessory plate.
f. forceps.
p. penis.
g. s. 1 and g. s. 2 first and second genital segments.
5 v. p. fifth ventral plate.

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## A NEW CISIDE GENUS WITH NEW SPECIES FROM MANITOBA.

BY CHARLES DURY, CINCINNATI, OHIO.

**Dolichocis,** new genus.

This genus is proposed for a species of narrow and elongate form, having a combination of the characters of *Cis* and other described Ciside genera. It has the antennæ 9-jointed, the elytra finely beaded along suture. The prothorax at side edges strongly margined and finely serrate.

**Dolichocis manitoba,** n. sp.

Elongate, narrow, oval in form. Brownish piceous in colour, when mature. Vestiture of rather sparse, pale setæ. Punctures deep and strong, those of prothorax closer and finer than those of elytra. Head—epistoma subtruncate and margined. Palpi thick, with terminal joint oval and blunt at tip. Prothorax as long as wide, with sides rounded, margined and with finely serrate edges. Elytra two and one-fourth times as long as wide. Beneath the prosternum is flat between coxæ, and long before them. Fore tibiæ not produced at outer tip. Males with a sharp, round fovea on first ventral. Length 2 mm.; width 07 mm.

Aweme, Manitoba. Norman and Talbot Criddle. From fungus growing on ash and elm. Twenty specimens; in the Canadian National Collection at Ottawa, Ont., and in my collection at Cincinnati, Ohio.

**Cis criddlei,** new species.

Elongate, with sides straight, colour piceous, vaguely paler on posterior third. Vestiture of conspicuous hairs arranged without order. Head with epistoma truncate and narrowly reflected. Prothorax as wide as long, sides feebly rounded. Hind angles viewed from above almost right angled. Punctures dense and deep. Elytra twice as long as wide, more sparsely and coarsely punctured than the prothorax. Beneath, the male has a large fovea on first ventral segment. Length 2 mm.; width 1 mm.

Aweme, Manitoba. Norman Criddle. Eight specimens; in Canadian National Collection at Ottawa, Ont., and my collection, Cincinnati, Ohio. This species is the size and shape of *Cis wenzeli,* but differs from that and all other species known to me in structural characters.

## ON SOME TINGIDÆ NEW TO THE FAUNA OF CANADA (HEMIP.).

BY CARL J. DRAKE, SYRACUSE, N.Y.*

**Corythucha salicis** Osborn and Drake.

Specimens of this insect were taken on willow, *Salix discolor*, at Aweme Manitoba, Aug. 13, 1918, by Mr. N. Criddle; other specimens were collected at Trenton, Ontario, Sept. 11, 1910, by Mr. Evans. From the United States specimens are at hand from Montana, Wisconsin, New York, Massachusetts and New Jersey. The known food plants are willow, *Salix* spp., and currants; *Ribes* sp.

**Corythucha elegans** Drake.

Mr. H. Groh took a few specimens of this species at Ottawa, Ontario, Oct. 13, 1908, on poplar, *Populus balsamifera*: two specimens were collected in Ontario, July 27, 1903, by Mr. Evans. One specimen is before me that bears the locality label "Mich." The type specimens are from Colorado. During the summer of 1917 and 1918 the writer noted hundreds of specimens, adults, nymphs and eggs, on willow in the vicinity of Cranberry Lake, New York.

**Corythucha padi** Drake.

Chilliwack, British Columbia, collected by Prof. F. C. Ewing. This insect breeds upon the western choke cherry, *Prunus demissa*. Specimens have been examined from Oregon, Washington, Idaho and Montana.

**Corythucha parshleyi** Gibson.

Several specimens, collected on walnut (*Juglans nigra*), butternut (*Juglans cinerea*), Japanese walnut (*Juglans sibboldiana*) and juneberry (*Amelanchier intermedia*). It is a common insect in the eastern part of United States, ranging from Canada to North Carolina.

**Corythucha heidemanni** Drake.

Two specimens, collected at Ottawa, Canada, by Mr. W. H. Harrington. This is a common insect that infests birch in the vicinity of Cranberry Lake, New York.

**Corythucha betulæ** Drake.

Two specimens from Ottawa, Canada, collected by Mr. Harrington. Thousands of specimens, adults, eggs and nymphs, have been seen by the writer on yellow birch, *Betula lenta*, in Adirondack Mountains, near Cranberry Lake, New York, during the summers of 1917 and 1918. Two specimens have also been examined from Maine.

**Corythucha immaculata** Osborn and Drake.

Lilloet, British Columbia, collected by Mr. A. W. A. Phoir. This species infests balsam root, *Balsamorrhiza sagittata*. Specimens are at hand from Oregon, Washington, Idaho, Montana and California.

**Corythucha hewitti,** new species.

Four specimens, taken on hazelnut, *Corylus americana*, October 8, 1918, at Aweme, Manitoba, by Mr. N. Criddle. Length 2.78 mm.; width 1.5 mm. *Type* and *paratype* in the National Collection of Insects, Entomological Branch, Ottawa; *paratype* in the author's collection. Named in honour of Dr. C. Gordon Hewitt, Dominion Entomologist.

Hood moderately elevated, the length slightly less than twice its height.

*Contribution from the Department of Forest Entomology, the New York State College of Forestry, Syracuse, New York.

Median carina slightly raised anteriorly; outer carinæ normal. Spines moderately long, the tips dark fuscous. Reticulations of the hood moderately large, slightly larger than those of the paranota. Tumid elevations of the elytra normal; costal area triseriate, the outer margin slightly concave.

A small spot on the paranota, another on the median carina, and greater part of the dorsal portion of the hood dark fuscous. Body beneath blackish, sometimes slightly tinged with reddish. Nervures whitish. Elytra with a band across the base, another near the apex, a spot on the paranota, part of the inner portion of sutural area dark fuscous. The apical band of the elytra without large hyaline cells; some cells with tiny hyaline centres. Legs and antennæ yellowish white.

Readily separated from the hazelnut tingid, *Corythucha coryli* Osborn and Drake, by the much less elevated hood. Akin to *C. bellula* Gibson, from which it may be distinguished by slightly longer spines, the globose portion of the hood being much less narrowed dorsally and not distinctly angulate at the crest, darker colour pattern, the apical band of elytra without large hyaline areolæ.

## DESCRIPTIONS OF FOUR NEW PARASITIC HYMENOPTERA.

BY S. A. ROHWER, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

### Tetrastichus rugglesi, new species.

*Female.*—Length 1.75 mm. Subopaque dark blue, without sculpture; intraocellar line subequal with the ocellocular line; antennæ eight-jointed; one ring joint a three-jointed funicle and two-jointed club; funicle joints subequal in length and subequal in length with the pedicle; club one-fourth shorter than two funicle joints, pointed apically, the apical joint longer than the preceding one; mesonotum with a rather faint median furrow; scutellum with two well-defined furrows; propodeum smooth, shining; prepectus sculptured like mesopleure, i. e., smooth and shining; abdomen ovate, ovipositor sheath slightly exserted; costal margin of hind wing with one spine. Antennæ brown; scape, tibiæ and tarsi and narrow apices of femora yellowish-white (tibiæ somewhat infuscated medianly); wings hyaline, venation yellowish.

*Type-locality.*—University Farm, St. Paul, Minnesota. Described from eleven females (one type) reared as parasites of *Agrilus arcuatus* by A. G. Ruggles. Material reared July 24, 1916, (type), July 11, 1916, and September 16, 1915.

*Type.*—Cat. No. 22132. U. S. Nat. Mus.

### Trigonura hicoriæ, new species.

*Female.*—Length 4.5 mm. Head with large umbilicate punctures; area between eyes about one-fourth greater than length of eye; antennal foveæ smooth; antennæ thirteen-jointed with one ring joint; ocellocular line slightly shorter than the interocellar line, and not much greater than the greatest diameter of a lateral ocellus; thorax with large umbilicate punctures, smaller and closer on the prothorax; the depressed area of mesepisternum in which the middle leg fits transversely striate; legs shining with very fine scattered punctures; hind femora with eight teeth, the three apical teeth close and smaller, the posterior one well removed from the others; abdomen shining, the apical segment with large, irregular setigerous punctures. Black; a yellowish spot on venter; four

anterior knees and all the tarsi yellowish-brown; wings hyaline; marginal and stigmatical veins black; a brown spot basad of stigma.

*Male.*—Length 4.25 mm. Except for usual differences, like female. Venter without yellow.

*Type-locality.*—Syracuse, New York. Described from two females and five males reared from *Hicoria glabra* by M. W. Blackman and H. H. Stage and under their numbers H-171 (type), H-114 (allotype), H-955, H-134, H-892, H-1367 and H-212.

*Type.*—Cat. No. 22093, U. S. Nat. Mus.

**Ecphylus hicoriæ,** new species.

Readily distinguished from related American species by its colour and sculpture.

*Female.*—Length to apex of abdomen 3 mm.; length of ovipositor 2.5 mm. Face granular and with irregular transverse, raised lines; frons and vertex with distinct transverse striæ; posterior orbits smooth; postocellar line about half as long as ocellocular line; antennæ 27-jointed, the third joint distinctly shorter than the fourth; pronotum with lateral angles prominent; prescutum punctured, and with a median impressed longitudinal line; notauli foveolate; scutellum without sculpture; propodeum coriaceous, reticulate in apical dorsal middle, a faint dorsal median longitudinal carina and a transverse carina at top of posterior aspect; recurrent interstitial with intercubitus; first tergite one-fourth longer than apical width, with distinct longitudinal striæ, these more prominent laterally so there is a triangularly-shaped median area which is not so coarsely striate, remaining abdominal segments smooth, polished. Black; abdomen beyond first segment rufous; basal joints of antennæ and legs yellowish-ferruginous; pronotum anteriorly and lower part of mesepisternum rufous (may not be constant); wings hyaline; venation dark brown.

*Male.*—Length 3 mm. Agrees with female except for usual differences.

*Type-locality.*—Syracuse, New York. Described from three females and one male reared from *Hicoria glabra* by M. W. Blackman and H. H. Stage, and recorded under their numbers H-972 (type , H-956, H-947 and H-118a allotype).

*Type.*—Cat. No. 22030, U. S. Nat. Mus.

In the male and in one female the frons are partly ferruginous.

**Heterospilus blackmanni,** new species.

Because of the colour and length of ovipositor this new species would be grouped with *consimilis* Ashmead, but the sculpture is quite different from that species.

*Female.*—Length to apex of abdomen 2.55; length of ovipositor 2.5 mm.; length of abdomen 1.25 mm. Head smooth, polished; ocelli in nearly an equilateral triangle; inner margins of eyes parallel, the distance between them somewhat greater than their length; antennæ, 20-jointed, the third joint about one-fifth longer than the fourth; scutum and prescutum shining, practically without sculpture; notauli well defined, not foveolate; suture in front of scutellum finely foveolate; scutellum smooth, shining; dorsal lateral areas of the propodeum polished, median carina distinct; posterior face of propodeum finely coriaceous; first tergite about one-sixth longer than apical width, with distinct longitudinal

striæ; base of the second tergite longitudinally aciculate; most of the second and all of the remaining tergites smooth, polished; mesepisternum smooth; sides of the propodeum sculptured like the posterior face; second abcissa shorter than the first intercubitus; recurrent slightly beyond the intercubitus. Black; mandibles, three basal joints of antennæ and the legs yellow; wings hyaline, venation pale brown, stigma somewhat darker.

*Male.*—Length 2 mm. Agrees well with female except the second tergite is yellowish.

*Type-locality.*—Syracuse, New York. Described from five females and one male collected by M. W. Blackman and H. H. Stage from *Hicoria glabra*, and recorded under their numbers H-107 (1 type), H-608, H-1141, H-118 and H-608a (allotype).

*Type.*—Cat. No. 22031, U. S. Nat. Mus.

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## NEW NEARCTIC CRANE-FLIES (RHYPHIDÆ AND TIPULIDÆ, DIPTERA) PART VII.

BY CHARLES P. ALEXANDER, STATE LABORATORY OF NATURAL HISTORY, URBANA, ILLINOIS.

### Family *Rhyphidæ.*

**Trichocera colei,** new species.

Thoracic stripes indistinct; wings light grey, yellowish at the base, a faint brown cloud on *r-m;* male hypopygium conspicuously enlarged.

*Male.*—Length, including the hypopygium, about 7–7.5 mm.; wing 6 mm.

Rostrum and palpi dark brown. Antennæ of the male setaceous, black. Head dark grey.

Mesonotum brownish grey without distinct stripes, the posterior half of the scutellum yellowish; postnotum dark. Pleura dark brown, sparsely grey pruinose. Halteres pale, the knobs dark. Legs light brown, the coxæ, trochanters and bases of the femora paler. Wings with a faint grey tinge, the base of the wing yellowish; stigma brown, diffuse; a brownish cloud on *r-m*. Venation: *Sc* ending slightly before *r; R*$_{2+3}$ a very little longer than *R*$_2$ before *r*.

Abdomen dark brown, the incisures paler. Male hypopygium conspicuous, very large for this genus of flies. Pleurites with a group of setæ near the distal end on the inner face. Pleural appendage longer than the pleurite, at the apex enlarged into a blackened lobe which is densely covered with short, erect, yellowish hairs; on the dorsal inner face near the base of this lobe, a slender cylindrical arm. Penis-guard broad at the base, rapidly narrowed to the blunt tip. Gonapophyses in the form of two strongly divergent chitinized horns.

*Habitat.*—Oregon.

*Holotype.*—♂, Forest Grove, Washington Co., November 11, 1918, (F. R. Cole). Type in the collection of the author. Paratype.—♂, Vancouver, Washington, Dec. 12, 1918, (Wm. Giles); reared from turnips. In the collection of the U. S. National Museum, Chittenden, No. 2772.

The conspicuous male hypopygium will easily separate the fly from any of the known American species. The species is dedicated to Mr. Frank R. Cole to whom I am indebted for many favours.

FAMILY *Tipulidæ*.

**Gonomyia (Gonomyia) mainensis,** new species.

Related to *G. subcinerea* O. S.; thoracic pleura striped; abdominal tergites dark brown; male hypopygium with the outer pleural lobe rather short with its apex obliquely truncated; inner lobe bifid, with a posterior flattened blade.

*Male.*—Length about 5 mm.; wing 5.6 mm.

Head dark, discoloured in the type. Antenna broken.

Pronotum clear light yellow. Mesonotal præscutum pale brown, with three indistinct, dark brown stripes, the lateral margins light coloured; scutum pale brown, the lobes dark; remainder of the mesonotum brown. Pleura light yellow with two distinct, purplish brown stripes, the ventral stripe occupying the mesosternum. Halteres very long and slender, pale, the knobs darkened. Legs with the coxæ dull brownish yellow, darkened on the base of the outer face; remainder of the legs light brown, the tarsi darker. Wings with a faint greyish tinge; stigma darker; veins dark brown. Venation: *Sc* rather long, ending opposite about one-third the length of the radial sector; *Rs* very long, straight; $R_{2+3}$ very long, $R_2$ correspondingly shortened; deflection of $R_{4+5}$ punctiform; cell *1st* $M_2$ with the inner end slightly narrowed; basal deflection of $Cu_1$ beyond the fork of *M*.

Abdomen dark brown, the hypopygium yellowish. Male hypopygium with the outer pleural lobe stout, hairy, slightly darkened toward the apex, which is obliquely truncated and produced inwardly into a small tooth; inner appendage bifid, consisting of a posterior flattened blade terminating in a hook, with a single seta on its face; ventral lobe short, terminating in about two stiff setæ. Gonapophyses small, curved, strongly chitinized, in the unique type unequal.

*Habitat.*—Maine.

*Holotype.*—♂, Fort Kent, Aroostook Co., August 29, 1913. Type in the collection of the author.

*Gonomyia mainensis* differs conspicuously from *G. subcinerea* in its striped pleura, venation, and, especially, the very different structure of the male hypopygium.

**Limnophila (Ephelia) angustior,** new species.

Wings narrow, the brown markings confined to the vicinity of the veins; pleurites of the male hypopygium with a tuft of long, yellow hairs at the apex; outer pleural appendage with a prominent lateral tooth on the outer margin.

*Male.*—Length 6.5 mm.; wing 7.5–7.6 mm.

*Female.*—Length 8–8.4 mm.; wing 8.3 mm.

Similar to *L. superlineata* Doane, differing as follows:

Antennæ dark brown throughout. Mesonotal præscutum without a lateral brown line, the lateral stripes less distinct, the median stripe entire Wings very narrow, strikingly different from those of either *L. superlineata* or *L. aprilina*. Wings light grey with a dark brown and greyish brown pattern, the costal markings relatively small, much narrower than the interspaces; the markings on the disk take the form of narrow seams along the veins and cross-veins; veins dark brown, *Sc* and *R* more yellowish. Venation: the supernumerary cross-vein in cell *M* is inserted so that it lies beyond the end of the

2nd anal vein; the wing pattern is not so heavy as in *L. aprilina*. Male hypopygium with the pleurites moderately elongated, covered with numerous setæ that become very numerous along the basal inner two-thirds; outer apical angle of the pleurite a little produced and blackened, provided with a loose tuft of long, yellow hairs that exceed the pleural appendages in length. Outer pleural appendage slender, with a prominent tooth before the apex on the outer margin, distad of this with numerous appressed teeth and a small, stout apical spine. Inner pleural appendage fleshy, stout, blunt at the tip.

*Habitat.*—Colorado.

*Holotype.*—♂, Platte Cañon, Jefferson Co., altitude 10,000 feet, June 27, 1915, (E. J. Oslar).

*Allotopotype.*—♀.

*Paratopotypes.*—11 ♂ ♀.

Type in the collection of the author.

**Limnophila (Ephelia) apiculata,** new species.

Closest to *L. angustior;* pleurites of the male hypopygium without an apical tuft of hairs; outer pleural appendage straight, without a prominent lateral tooth on the outer margin.

*Male.*—Length, about 6.8 mm.; wing 7.2 mm.

Very similar to *L. angustior*, differing as follows:

Antennal flagellum with the basal segments light brownish yellow, passing into darker brown on the terminal segments. Mesonotum light grey with four dark brown stripes, the intermediate pair very long and separated by a capillary vitta of the ground colour. Dark tips to the femora and tibiæ less distinct. Wings slightly more yellowish, the brown pattern heavier but confined to the vicinity of the veins. Abdomen dull brownish yellow, with an indistinct, dark brown dorso-median stripe. Hypopygium more reddish. Pleurites moderately stout, without a conspicuous apical tuft of long yellowish hairs. Outer pleural appendage black, stout, the apical third along the outer margin with numerous, acute, appressed teeth, the terminal one extended into a free spine. Inner pleural appendage fleshy, pale, covered with numerous stout setæ, the apex narrowed and tipped with three or four setæ.

*Habitat.*—California.

*Holotype.*—♂, Alpine, San Diego Co., April 8, 1915, (M. C. Van Duzee).

*Paratopotype.*—♂.

Type in the collection of the author.

**Limnophila (Ephelia) edentata,** new species.

Closest to *L. superlineata* Doane; size small, wing of the male about 6.5 mm.; first segment of the antennal flagellum yellowish; wings with a heavy brown pattern, the outer four costal blotches confluent in pairs; outer pleural appendage of the male hypopygium without appressed lateral teeth on the outer margin near the apex.

*Male.*—Length 5.6 mm.; wing 6.5 mm.

Similar to *L. superlineata* Doane but differing in numerous regards: Size very small. First flagellar segment of the antennæ yellow, the remaining flagellar segments light brown. The median præscutal stripe is widely divided for its entire length; in addition to the narrow lateral stripes and a dark spot

at the margin of the sclerite, there is a small, brown line between the lateral and intermediate stripes that crosses the suture onto the scutal lobes. The femoral tips are broadly dark brown, but the tibial tips are but narrowly and indistinctly darkened. The wings are narrower with a much heavier pattern, the markings at *Sc*1 and *R*1, and at *R*2 and R3 being confluent behind; a few brown dots in the costal and subcostal cells between the larger blotches; petiole of cell *M*1 a little longer than this cell. Male hypopygium with the pleurites rather slender. Outer pleural appendage blackened, terminating in a long, curved hook whose outer margin is not minutely tooth as in many species of the subgenus; on the outer face before the tip with a stout spine; a small, blackened tubercule on the inner margin near the base of the appendage. Inner pleural appendage stout and broad, flattened, covered with numerous setæ.

*Habitat.*—California.

*Holotype.*—♂, Apline, San Diego Co., April 9, 1915, (M. C. Van Duzee).

Type in the collection of the author.

**Eriocera saturata,** new species.

Antennæ black, the scapal segments brighter; præscutum yellowish gray with four dark brown stripes, the intermediate pair narrow; wings reddish brown; cell *M*1 lacking; abdomen dark brown, the lateral margins broadly yellowish.

*Female.*—Length 13.5 mm.; wing 9.4 mm.

Rostrum short, light brown. Palpi black, the basal segments more brownish. Antennæ with the scapal segments yellowish brown above, reddish beneath; flagellum black. Head broad, brown, with an indistinct darker median area. Frontal tubercle dark brown.

Mesonotal præscutum yellowish gray with four dark brown stripes, the intermediate stripes very narrow, separated from one another by a distance a little less than the diameter of one; anterior portion of the scutal lobes dark; scutellum grey, with the extreme base darkened; postnotum grey. Pleura clear silvery grey, the dorsal pleural region dark brown. Halteres short, brownish yellow, the knobs dark brown. Legs with the coxæ pale brown, sparsely grey pruinose; trochanters brownish yellow; femora brownish yellow, narrowly darker at the tips; tibiæ and tarsi brown. Wings with a strong reddish brown suffusion, the colour being a little darker than in *E. californica* O. S.; a small, brown cloud on *r-m;* veins *Sc* and *R* brown, remaining veins dark brownish black; stigma indistinct. Venation: Cell *M*1 lacking; vein *M*1+2 beyond cell *1st M*2 longer than this cell.

Abdominal tergites dark brown, the lateral margins broadly yellowish. Ovipositor rusty red; sternites light brown, margined laterally with yellow.

*Habitat.*—California.

*Holotype.*—♀, Fallbrook, San Diego Co., August 2, 1917, (E. G. Holt).

Type in the United States Biological Survey collection.

*E. saturata* is closest to *E. velveta* Doane from which it may be told by its deep, saturated reddish brown wings with the stigma not darkened, the greater length of the veins issuing from cell *1st M*2, the colour of the abdomen and other characters.

**Tricyphona macateei,** new species.

Antennæ black; mesonotum yellowish grey, the præscutum with three stripes of which the median one is divided by a capillary pale line; wings nearly hyaline with a heavy dark brown and grey pattern, the mark at the origin of the sector running into the costal cell; abdominal segments indistinctly banded with yellowish.

*Male.*—Length 8–8.5 mm.; wing 7.8–8.6 mm.

Rostrum and palpi dark brownish black. Antennæ dark brownish black throughout, the intermediate flagellar segments short-cylindrical or almost rounded, the terminal segments smaller. Eyes broadly contiguous beneath, widely separated above. Head small, dark grey.

Mesonotal præscutum light yellowish gray, with three brown stripes, the median stripe more or less distinctly divided by a ground vitta, this pale stripe clearer behind; scutal lobes dark. Pleura gray with indistinct blotches of darker Halteres short, pale brown, the knobs dark brown. Legs with the coxæ dull yellow, the middle and posterior coxæ sparsely grey pruinose; trochanters dull yellow; femora brownish yellow, the tips broadly dark brown; tibiæ and tarsi dark brown. Wings almost hyaline with a heavy dark brown and grey pattern, this including about six larger markings along the costal margin, the first surrounding the humeral cross-vein, the second $Sc_2$, the third the origin of the sector, passing into the costal cell, the fourth mark at the tip of $Sc_1$; small, pale seams along the margin of the wing at the ends of the veins; narrow seams along the cord and *m*. Venation: $Sc_2$ about midlength between *h* and the origin of the sector; *Rs* very strongly arcuated at origin; cell $M_1$ shallow, its petiole longer than *m*; *m-cu* obliterated by the punctiform contact of $Cu_1$ and *M*.

Abdominal tergites indistinctly banded with dark brown and paler yellowish brown; sternites brown, the posterior half of each of the intermediate segments yellow. The male hypopygium shows the moderately powerful pleurites inclined toward one another so that the tips are contiguous, the apices with abundant blackened spicules.

*Habitat.*—Maryland.

*Holotype.*—♂, Beltsville, Prince George Co., October 7, 1917, (W. L. McAtee).

*Paratopotype.*—♂.

Type in the United States Biological Survey collection.

*T. macateei* is readily separated from *T. vernalis* (O. S.) by the uniformly dark antennæ, the almost hyaline wings with the pattern larger, darker and more clearly defined, the blotch at the origin of the sector including the costal cell, the short cell $M_1$ with a long petiole and other characters. This very interesting new species is dedicated to its collector. Mr. W. L. McAtee.

**Tipula pendulifera,** new species.

Belongs to the *cunctans* group; antennal flagellum dark brown; mesonotum light grey, the præscutum with four stripes; wings with a faint yellowish tinge, the stigmal region and wing-base more suffused; abdomen yellowish with a broad, dark brown median stripe; male hypopygium with a long, pendulous lobe at the ventral angle of each pleurite.

*Male.*—Length 17 mm.; wing 18 mm.

*Female.*—Length about 20–21 mm.; wing 18.5–19 mm.

Frontal prolongation of the head brownish grey. Palpi dark brown. Antennæ with the scape reddish brown, the flagellar segments uniformly dark brown. Head dark grey.

Mesonotal præscutum light grey with four greyish brown stripes; scutellum and postnotum clear light grey. Pleura heavily greyish white pruinose. Halteres light brown. Legs with the coxæ yellowish, sparsely grey pruinose; trochanters and femora light brown, the latter darkened at the tips; tibiæ yellowish brown, the tips darkened; tarsi brown. Wings with a faint yellow suffusion; base of the wing and the stigmal region yellowish, this latter including the apex of the costal cell, the apex of cell *1st* $R_1$ and most of cell *2nd* $R_2$; costal and subcostal cells brownish; veins dark brown. Venation: Petiole of cell $M_1$ short.

Abdomen yellowish; segment eight and the basal half of nine in the male dark brown; a very distinct, dark brown, median stripe on both the tergites and sternites; on the former it begins at about midlength of the first tergite as a narrow line, gradually widening behind; these stripes are continuous except for narrow yellowish silvery posterior margins to the segments. Male hypopygium with the sclerites fused into an almost continuous ring. Eighth tergite concealed beneath the seventh, except laterally. Ninth tergite extensive, the posterior margin with a broad median notch, the lateral angles subacute, blackened; on either side of the median line is a small obtuse knob; the ventral margin of the ninth tergite bears two median blackened points. Region of the ninth pleurite long and narrow. Outer pleural appendage broad and flattened, pale, very narrow at the base. Inner pleural appendage complicated in structure. At the ventral angle of each pleurite hangs a very long, pendulous lobe, pale, directed ventrad, slightly enlarged distally and here provided with long, coarse hairs; the dorsal end of this appendage is likewise slightly produced. Between these pendulous lobes a flattened, elongate oval disk is visible.

The female is similar to the male, differing in the sexual characters; the dorsal abdominal stripe is narrower and attains the end of the seventh tergite. Ovipositor with the tergal valves straight; sternal valves very short, high, obtusely rounded at their tips, a little more than one-half the length of the tergal valves.

*Habitat.*—Colorado (Saguache County).

*Holotype.*—♂, Cochetopa National Forest, Upper Saguache Ranger Station, September 7, 1917, (A. K. Fisher).

*Allotopotype.*—♀.

*Paratopotypes.*—3 ♀'s.

Type in the United States Biological Survey collection.

*T. pendulifera* is a well-defined species, allied to *T. cunctans* and *T. carinata*, from which it is easily told by its larger size, and the conspicuous pendulous lobes of the male hypopygium.

**Tipula noveboracensis,** new species.

Belongs to the *tricolor* group, closest to *T. caloptera* Lw.; antennal flagellum short, dark brown; wings with cells $M_1$, $M_2$, $Cu_1$ and most of $M_3$ brown; male

hypopygium with a powerful curved clawlike horn on either side of the median lobe of the ninth tergite.

*Male.*—Length, 18–22 mm.; wing, 20.5–25.5 mm.

Close to *T. caloptera* Lw., differing as follows:

Antennal flagellum short, darker, almost uniformly dark brown, the first segment a little paler.

Ground colour of the thorax, including the pleura, bright silvery white. Præscutal stripes darker, the lateral stripes more or less confluent anteriorly with the median stripe, the pale ground interspaces indicated near the suture. Wings with the brown markings darker and differently arranged: cell *1st* $M_2$ and the apical two-thirds of $R_5$ hyaline, cells $M_1$, $M_2$, $Cu_1$ and all but the extreme base of $M_3$ brown; in *T. caloptera* the white area includes the basal half of cell *1st* $M_2$, the bases of cells $M_1$, $M_2$ and $M_3$ and the apical half of cell $R_5$; the brown in the base of cell *M* is about equally extensive in the two species.

The abdominal pattern is more contrasted than in *T. caloptera*, the broad, lateral stripe being almost black; in the holotype, the ground colour of the tergites is yellowish on the first two segments only, on the remaining segments passing into grey; in the paratypes, however, the bright yellow colour persists to the fifth or sixth segments; in all cases the black, lateral stripes are narrowly connected across the caudal ends of the segments; the lateral margins of the tergites are broadly silvery, more buffy near the end of the abdomen. Male hypopygium conspicuously different from the other members of the *tricolor* group, the narrow, rectangular, somewhat depressed, median lobe with parallel sides being subtended on either side by a powerful, slightly curved clawlike horn which is sometimes slightly roughened.

*Habitat.*—Northeastern North America.

*Holotype.*—♂, Power-house Creek, near Gloversville, Fulton Co., New York, altitude 1,000 feet, June 24, 1916, (C. P. Alexander).

*Paratopotypes*, 2 ♂'s; *paratypes*, ♂, Ithaca, Thompkins Co., New York, May 12, 1915, (C. P. Alexander); ♂, May 24, 1898, pinned with the cast pupal skin; ♂'s, Beaver Dam, New Brunswick, June 23, 1914, (J. D. Tothill).

Type in the collection of the author.

The type and paratopotypes were found resting on small boulders projecting from the bed of a small mountain stream. The flight of these large, beautiful crane-flies is unusually vigorous for a member of this family.

**Tipula calopteroides,** new species.

Belongs to the *tricolor* group, closest to *T. caloptera* Lw.; antennal flagellum long, clearly bicolorous; mesonotal præscutum with the stripes dull grey, not distinctly margined with darker; wings with the base of cell *M* clear.

*Female.*—Length about 25 mm.; wing 25.3 mm.

Close to *Tipula caloptera* Lw., differing as follows:

Antennæ longer, distinctly bicolorous, the basal enlargement of the flagellar segments dark brown, remainder of the segments yellowish.

Mesonotal prescutal stripes dull grey, very indistinct, the usual dark margins scarcely evident; the brown median vitta very distinct. Wings with considerably more pale markings than in *T. caloptera*, more nearly approaching the type of *T. strepens;* the brown in the base of cell *M* practically lacking

excepting the usual broad brown seam along *Cu* and its branches; the pale pattern includes the base of cell *1st* $M_2$, apical two-thirds of cell $R_5$, base of cells $M_1$, $M_2$ and $M_3$, and the centre of cell $Cu_1$.

Abdominal tergites with the dark brown lateral stripes very broad, about as wide as the yellow mid-dorsal area, this latter most distinct on tergites one to seven.

*Habitat.*—North Carolina.

*Holotype.*—♀, Canton, Haywood Co., June, 1911.

Type in the collection of the author.

**Tipula manahatta,** new species.

Belongs to the *tricolor* group, closest to *T. sackeniana* Alex.; antennal flagellum light yellow throughout; mesonotum reddish brown with indistinct præscutal stripes; wings with a strong fulvous tinge with scarcely any pale areas on the membrane; abdomen reddish brown without darker stripes.

*Male.*—Length about 15 mm.; wing 15 mm.

Frontal prolongation of the head light yellowish on the sides, darker above, indistinctly lined with brown; palpi short, brown, the basal segments more yellowish. Antennæ moderately elongated, the scapal segments brown, the flagellar segments light yellowish throughout, the terminal segment brown. Vertex dark grey; occiput and a very narrow margin around the eye paler.

Mesonotum reddish brown, the præscutal stripes very indistinct; scutellum yellow. Pleura yellowish, the mesopleuræ faintly grey pruinose. Halteres dark brown, yellowish at the extreme base. Legs with the coxæ yellowish, faintly pruinose; trochanters yellow; femora and tibiæ reddish brown throughout; tarsi dark brown. Wings with a strong greyish fulvous tinge, the costal margin and a broad seam along *Cu* very broad, rich fulvous; there are scarcely any paler areas on the membrane, the obliterative streak extending about to mid-length of cell $M_4$; cell $R_5$, and the bases of the anal cells a little pale.

Abdomen reddish brown, the sides of the first segment more yellowish; abdominal tergites very narrowly and indistinctly ringed caudally with silvery. Male hypopygium as in the *tricolor* group, the sclerites of the ninth segment fused into a continuous compressed ring. Ninth tergite with the median lobe, prominent, depressed, slightly expanded distally, reddish, the extreme posterior margin minutely spiculose; margin of the sclerites between the tergal and pleural regions light yellowish. Outer pleural appendage large, fleshy, distinctly notched at its apex, covered with short dense hairs. Inner pleural appendage subchitinized, flattened, with a deep split that separates off a posterior hook or lobule whose posterior margin is grooved longitudinally into a scrobe; posterior margin of the anterior appendage with a high, flattened carina; apex broadly rounded. At the base and ventrad of the pleural appendage is a triangular lobe which is densely covered with a short, golden yellow pubescence and, ventrally, a number of long reddish hairs. Region of the ninth sternite extensive, the adjacent margins almost continuous, from between them projecting the straight, slender penis-guard and two small oval, flattened lobes.

*Habitat.*—New York (Suffolk County).

*Holotype.*—♂, Yaphank, Long Island, September 3–4, (Charles Schaeffer).

*Paratopotype.*—♂.

Type in the collection of the Brooklyn Museum.

**Tipula phoroctenia,** new species.

Belongs to the *marmorata* group, closest to *T. fragilis* Lw.; male hypopygium with the ninth tergite having a broad V-shaped notch; outer pleural appendage without a basal tooth; eighth sternite strongly projecting, shovel-like, the posterior margin shallowly notched and with a row of black, comb-like spines.

*Male.*—Length about 13 mm., wing 14 mm.

Similar to *T. fragilis* Lw. in most respects, differing as follows: The praescutal stripes are broader and less distinct, the intermediate pair extending a little farther cephalad, the grey thoracic interspaces narrower. The wings are a little narrower, with the dark pattern less distinct. The abdomen is light yellow with a narrow, dark brown sublateral stripe and silvery grey lateral margins. The ninth tergite and the sixth to ninth sternites are dark brown. The most conspicuous differences are to be found in the structure of the male hypopygium, the ninth tergite of which has a broad, posterior V-shaped notch the caudal margin blackened, with the lobes running out into slender, chitinized points, the space between with a few smaller elevations; lateral notches extensive, not so deep as in *T. fragilis*. Outer pleural appendage long, slender, somewhat flattened, without a distinct chitinized basal ridge or tooth as in most other species of the group. The fleshy lobes that arise near the ventral angle of the pleurites are very large so that they practically fill this portion of the opening of the genital chamber; they are pale reddish, covered with a short, dense pale pubescence. Ninth sternite with a broad square notch, from the base of which projects a stout, reddish rod, presumably the penis-guard. Eighth sternite extensive, projecting, the posterior margin nearly truncated with a very shallow notch, set with a row of short, black spinous teeth; extreme posterior lateral angles of the sternite with a few long yellowish hairs.

*Habitat.*—Maine.

*Holotype.*—♂, Orono, Penobscot Co., in a bog at the edge of a wood, October 3, 1913, (H. M. Parshley).

*Paratopotype.*—♂, indoors, October 16, 1913.

Type in the collection of the author.

**Tipula nebulipennis,** new species.

Belongs to the *marmorata* group, closest to *T. fragilis* Lw.; legs mostly brown with only the femoral bases yellowish; male hypopygium having the caudal margin of the ninth tergite with two flattened divergent lobes separated from one another by a very small notch; outer pleural appendage with a subacute shiny chitinized tooth; eighth sternite slighlty projecting, the posterior margin with a broad, U-shaped median notch.

*Male.*—Length 12–13 mm.; wing, 12.2–13.5 mm.

Frontal prolongation of the head dark grey, the sides more brownish. palpi short, brownish black. Antennæ with the scape yellow, the flagellum brownish black; flagellar segments only slightly enlarged basally. Head grey.

Mesonotal præscutum light grey with four brown stripes, the intermediate pair becoming indistinct anterior to the level of the pseudosutural foveæ; scutal lobes largely brown; scuteflum and postnotum light grey. Pleura grey, clearer and lighter posteriorly. Halteres brown, the extreme base yellow. Legs with the coxæ light grey; trochanters light yellow; femora yellowish basally, soon passing into brown, the tip narrowly darker brown; tibiæ with the basal half light brown, the apical half darker brown; tarsi dark brown. Wing pattern and venation about as in *T. fragilis*, the stigma paler brown.

Abdomen with the first tergite grey pruinose, the other tergites brown with a broad, dark brown sublateral stripe, ringed posteriorly with yellowish, these rings broadest on the basal segments, becoming indistinct about the seventh segment; sternites one to five bright yellow, the basal segments a little darker laterally; remaining sternites dark brown. Male hypopygium with the ninth tergite rather large, divided into two apparent halves by a mid-dorsal impression; each half is produced caudad into an inner flattened lobe, separated from its mate of the opposite side by a very small and narrow notch, the lateral angle of each lobe slightly produced and with a few stout black setæ; the tergite is dark, the lateral margins yellowish, the apical lobes orange yellow and provided with a short, dense pubescence. Outer pleural appendage large, greyish, slightly curved, the outer face with appressed black hairs; near the base of the appendage a shiny, flattened, chitinized tooth. Inner pleural appendage compressed, flattened, extensive, near its base forming a cup-like hollow. An enlarged, dark-coloured, fleshy lobe provided with numerous pale hairs lies on either side near the ventral angle of the pleurite, extending dorsad along the opening of the genital chamber; the outer basal margin of this lobe is light yellow in colour. Eighth sternite slightly projecting, the posterior margin with a large, shallow, broadly U-shaped notch, the lateral angles of which are provided with long whitish hairs, the outer basal margin of this lobe minutely spinulose, light yellow beneath.

*Habitat.*—Labrador.

*Holotype.*—♂, Battle Harbour, August 1, 1912, (G. P. Engelhardt).

*Paratopotype.*—♂.

Type in the collection of the Brooklyn Museum.

**Tipula fragilina,** new species.

Belongs to the *marmorata* group, closest to *T. fragilis* Lw.; legs darkened, the femora with a broad, yellowish subterminal ring before the black tip; male hypopygium having the ninth tergite with a wide V-shaped notch: outer pleural appendage with a blunt, blackened basal lobe; eighth sternite carinate, the posterior margin with a very deep and narrow median notch, the margins contiguous or nearly so and provided with long, yellowish hairs.

*Male.*—Length about 13 mm.; wing 13.3 mm.

*Female.*—Length about 13 mm.; wing 13 mm.

Generally similar to *T. fragilis* Lw., differing as follows: The intermediate stripes of the præscutum are broader and extend further cephalad; the ground colour between the intermediate and lateral stripes narrower. Pruinosity of the pleura darker. Legs darker, the black femoral tips broader and with a

distinct yellow subterminal ring. Hypopygium darker coloured. The most striking differences between this and the related regional species are found in the male hypopygium, as follows:

Ninth tergite dark coloured, with a deep, impressed mid-dorsal line; posterior margin with a wide V-shaped notch, the lateral lobes formed terminating in blackened chitinized points, the lateral notches only slightly concave, larger and not so deeply rounded as in *T. fragilis*. Outer pleural appendage long, slightly flattened, not as stout as usual in the group, pale, almost white in colour, the basal third slightly contracted and produced proximad into a blunt, blackened lobe. Inner pleural appendage a pale, almost white, compressed blade, on the posterior margin near the base bearing a small knob provided with numerous short, black setæ. At the ventral angle of the pleurite, jutting dorsad across the face of the genital chamber as a long, slender, slightly sinuous lobe tapering to a point, densely covered with white hairs; this structure is considerably larger than the corresponding one in *T. fragilis*. Ninth sternite with a deep notch which is slightly enlarged at its base, the sides parallel or nearly so. Eighth sternite compressed, with a very deep median notch, the adjacent lobes contiguous apically, though separated basally, provided with long, yellow hairs. In *T. fragilis*, the eighth sternite is spade-shaped, unnotched.

*Habitat.*—Alaska. (Iditarod River Country).

*Holotype.*—♂, Flat, September 6, 1917, (A. N. Twitchell).

*Allotype.*—♀, Bethel, September 24, 1917, (A. N. Twitchell).

Type in the United States Biological Survey collection.

**Nephrotoma euceroides,** new species.

Generally similar to *N. cucera* (Lw.) from which it differs as follows: Average size much smaller (male, length 14–14.2 mm.; wing 13.8–15 mm.). Male antennæ with only 17 evident segments. Thoracic stripes distinct, reddish brown, much darker than in *N. cucera*. Wings with a more greyish yellow tinge, the stigma poorly defined, pale. Abdomen darker, brownish yellow, the hypopygium brown. Male hypopygium with the ninth tergite having the caudal margin evenly rounded with a small, narrow median notch whose nearly contiguous lateral angles are produced beneath into blackened lobes which are densely spiculose. Eighth sternite with a broad, deep posterior notch, the median area of the sternite not so densely hairy as in *N. cucera*.

*Habitat.*—Northeastern North America.

*Holotype.*—♂, Sport Island, Fulton Co., New York, altitude 750 feet. June 16, 1910, (C. P. Alexander).

*Paratype.*—♂, Perth, New Brunswick, June 15, 1915, (F. M. McKenzie).

In general appearance, *N. euceroides* is very similar to *N. breviorcornis* (Doane) from which it is most easily told by the number and structure of the antennal segments.

Mailed July 8th, 1919

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### COLLECTING TERRESTRIAL ARTHROPODS IN BARBADOS AND ANTIGUA, BRITISH WEST INDIES.

BY DAYTON STONER, IOWA CITY, IOWA.

### I. Barbados.

The data upon which the following notes are based were secured by the writer and Mrs. Stoner during the time spent on the islands of Barbados and Antigua as members of the Barbados-Antigua Expedition sent out by the University of Iowa in the spring of 1918. The time between May 9 and June 17 was spent at Barbados. Collecting at Antigua was done between June 19 and July 19.

The island of Barbados is situated in 13° 4′ North latitude and 59° 37′ West longitude, and is the most easterly of the Antillean chain. It is about twenty-one miles long by fourteen broad, with an area of 166 square miles and a population of about 200,000, nine-tenths of which is black. The strata forming the basement series of Barbados consist of siliceous and calcareous sandstones and clays. About six-sevenths of the total area of the island is covered by a cap of coral rock which is more or less flat, and rises in a series of terraces to Mt. Hillaby in the "Scotland district," which is 1,104 feet in height. An area of approximately 6,000 acres at the northern and eastern side of the island has received that name on account of its peaked and hilly character. The remainder of the island is low and flat or at most slightly rolling, with few swamps and marshes and but two or three fresh water streams of any importance. Practically all the tillable land is under sugar cane, and but few remnants of the forests which once covered the island now remain. The annual rainfall is about sixty inches, and usually comes in the form of showers during the summer months. The dry season occurs in the winter and early spring months.

On account of the slight physiographic differentiation, the almost uniform state of cultivation and the density of the population, Barbados is not a particularly favorable place for collecting insects. In addition, practically all the grass land is closely grazed by goats and cattle, so that dense growths of vegetation are much restricted. In general the affinities of the insect fauna are with that of South America, but a number of North American and closely allied forms are to be found. A few indigenous forms also occur.

Whenever the entomologists started out on a collecting trip, the fact was quickly noised abroad that strange people were collecting butterflies. How the news spread so quickly was somewhat of a mystery in view of the fact that telephone service is seldom available to the blacks. But in a short while groups of children and older persons as well would put in their appearance and express a desire first to know what we were going to do with the insects, and suggesting as a probable answer that perhaps they were to be made into medicine. Having been more or less satisfactorily appeased by our answers, the second thought was to be of assistance—for a consideration. After a few usually vain attempts

to secure the particular insects desired the youngsters desisted in their efforts to capture specimens, but often continued to follow at a safe distance to view the strangers. Not always were the followers peaceable, for on one occasion the entomologist was followed for a considerable distance over the hills of the Scotland district by an ever-increasing mob of black children, who drew others from far and near by their shouts of "A German spy." On another occasion the writer was taken for an escaped lunatic, and three big black fellows armed with a rope were making ready to capture the luckless "bug man" and escort him within the four walls of the nearby lazaretto. However, the persuasive powers of the intended victim were sufficient to permit him to continue unmolested.

Among the men in "Little England" who take a special interest in entomology and who did much to aid us were Mr. Wm. Nowell, Mycologist in the Imperial Department of Agriculture; Dr. J. C. Hutson, the then Acting Entomologist in that Department, and who was taking the place of the regular Entomologist; Mr. H. A. Ballou, then absent in Africa on special economic investigations, and Mr. J. R. Bovell, Entomologist in the Colonial Department of Agriculture. Rev. N. B. Watson, of St. Lucy's Parish, one of the delightful old-time naturalists, has a fine collection of native insects, and Sir Gilbert Carter, a former Governor of Barbados, has in his beautiful home an excellent collection of native Lepidoptera.

A few of the principal collecting places may be briefly referred to here. One of the chief places frequented by insects of various kinds is the more or less protected series of terraces referred to above. Here on the side next the sea the vegetation is somewhat sheltered from the direct rays of the sun, and the more delicate shrubs, small trees, weeds and Solanaceæ in particular offer a plentiful supply of food for plant-feeding insects, many kinds of which were taken in the sweep net.

The high, dry flats between these terraces are often thickly overgrown with the long, dense, sour grass which, however, is harsh and supports few insects other than grasshoppers.

It was indeed a pleasure to meet with one of our old friends, *Megilla maculata* along with many other less well-known forms of Coleoptera, as well as an abundance of Hemiptera in the small ditches scattered over the island. These are usually grown over with grass and weeds, and in them, during heavy rains, the water flows in torrents; shortly thereafter they again become dry, but the stimulus given the vegetation by the more than usual amount of water keeps it continually green and fresh. The surrounding country often becomes exceedingly dry, and many species of insects congregate in these well-watered places on account of the abundant food supply.

The semiaquatic vegetation bordering small pools and streams also often furnishes good collecting places, as indeed do the waters and bottoms of the pools and streams themselves.

Often along the uncultivated borders of cane fields various kinds of weeds and grasses grow, particularly if in low or somewhat moist and shaded situations. Even the cane fields themselves offer somewhat limited opportunity for collecting.

Nor should the Scotland district with its dense tropical vegetation and

its rock ledges and bluffs be omitted; nor Calais and other sandy beaches; nor the cliffs and upland flats near Speightstown—each somewhat different in its aspect from the other, and lending some variety to the scenery as well as to the day's catch.

The Arachnids are extremely well represented on Barbados, and vary in size from spiders with an extent of from four to five inches to the minute *Tetranychus*. The Barbados tarantula, a tailless whip scorpion, is among the most interesting of the group, and is commonly found under the moist bark of decaying trees.

Myriapods are very common. A black Julid with transverse markings of green and averaging from four to four and one-half centimeters in length is most abundant. On one occasion a sort of migratory movement of these Arthropods was observed. Hundreds of them were crossing the dazzling white coral road in moving from one cane field to another, and all seemed to be going in the same direction. A small Polydesmid is very common under rocks along the bases of the terraces.

Scolopendrids are abundant under sticks and stones in damp places and under the dried leaves of sugar cane, with which some of the fields are covered. These Centipedes are known locally as "forty-legs," and the natives have a great fear of them. The popular belief is that a bite from one of them will cause a "fever" in the victim. The specimens are commonly from three to six inches in length, very active and difficult to handle, and it requires considerable dexterity to transfer one safely to the killing bottle without being bitten.

Many years ago the Mongoose (*Herpestes*) was imported into Barbados for the purpose of destroying the rats. It is now fairly common all over the island. While it, no doubt, has been responsible for some diminution in the number of rats the experiment has not been a success for in addition to its destruction of birds of various kinds, particularly the Ground doves (*Columbigallina*), the blood-thirsty animal has killed off a great many lizards and centipedes, which are enemies of insects. As a result destructive insects have become more abundant on the island since the introduction of this animal, which is now much despised by the natives

Of the Hexapoda only the more conspicuous will be mentioned here. On account of the scarcity of suitable breeding places the order Odonata is not well represented. The vicinity of Indian and Bird Rivers and the large swamp in the suburbs of Bridgetown offer limited opportunity for larval development. The common pond fly (*Erythrodiplax umbrata*) and the red pond fly (*Tramea abdominalis*) are probably the most abundant. Four or five other representatives of the order occur here also.

The order Orthoptera is represented by a goodly number of species. Earwigs (*Forficula*) are common in rocky places in the vicinity of cane fields, and in leaf sheaths and stems of old canes. Cockroaches are abundant in cane fields and houses; a half dozen species are found on the island. One of the most common, and at the same time conspicuous representatives of the group is the large, yellowish, short-horned grasshopper (*Schistocerca pallens*), which is found commonly on the flats grown up in sour grass. The insect is very difficult to capture on account of its rapid flight and its habit, when closely pursued, of crawling some distance in the short grass before again taking flight, and then

of springing up suddenly in an unexpected quarter and flying off again. Many miles were traversed in pursuit of these elusive insects. Another common Acridiid is *Orphulella balloui*, which also frequents grass lands. Conocephalids and Gryllids are not abundant.

The Hemiptera is the best represented of any of the orders, both in actual abundance and in number of species. Of the aquatic forms the water strider *Gerris marginata* is by far the most abundant, and is found in all the permanent fresh-water streams and ponds of any size. Of the other Heteroptera the family Pentatomidæ is well represented, about twelve species having been collected. The two most common species are the green bug (*Nezara viridula*) and the brown bug, known locally as the "pea chink" (*Edessa meditabunda*). This latter form is one of the most abundant plant feeding Heteroptera on the island. Two other Pentatomids, *Piezodorus guildinii* and *Arvelius albopunctatus* are also worthy of mention, the former being much the commoner of the two. The cotton stainers (*Dysdercus* spp.) have not yet made their appearance on Barbados although they are present in all the other islands of the West Indian group. Of the Homoptera there are several kinds of scale insects; Cicadellids and Membracids are common on vegetation in moist or partly-shaded places; a few Fulgorids are found in the wooded Scotland district.

Beetles are well represented on Barbados, and a number of them are of considerable economic importance. Perhaps the most conspicuous species in this connection is the Scarabæid beetle, locally called the "brown hardback" (*Phytalus smithi*), the larvæ of which injure the roots of sugar cane, citrus trees, palms and pananas. Effort is being made by the Colonial Department of Agriculture to control the pest by offering prizes to schools and schoolmasters for the greatest number of the insects brought in to the entomologist's office. In addition, a "bounty" of 2d. per four hundred is paid. The writer saw in a glass laboratory jar in Mr Bovell's office 27,200 live specimens of this beetle which had been collected for the bounty offered. In 1916 the collection of adults on one estate amounted to 589,680. A small Hymenopteron, *Tiphia parallela*, is parasitic on the beetle, but the parasite is not sufficiently abundant to hold the pest in check.

A single tiger-beetle (*Cicindela suturalis* var. *hebræa*) is found upon the island, and at only one place, Calais beach, southeast of Bridgetown. A long stretch of sand affords a typical habitat for this beautiful white form.

Of the aquatic beetles the Dytiscidæ are most abundant, though in the larger pools and streams the large black Hydrophilid, *H. ater*, is not uncommon. Among the Coccinellids, in addition to the common spotted ladybird (*M. maculata*) the red ladybird (*Coccinella sanguinea*) is also found, and is even more common than the former. Strangely enough carrion beetles are not found upon Barbados, and but one species of short-winged scavenger beetle was collected. Once, upon coming across the decaying remains of a mongoose the carcass was examined carefully for insects, but the net result was a single fly puparium. Two other beetles should receive special mention on account of their abundance. The fine black Tenebrionid *Hopatrinus gemellatus* is found everywhere under small stones along the bases of the terraces, and the Chrysomelid *Homophœta aequinoctinalis* is abundant on the common weeds and grasses.

Of the weevils the beautiful gray and black striped Curculionid *Diaprepes*

*abbreviatus* is one of the most common and, at the same time, destructive. The larvæ are very injurious to sugar cane, boring into the cane bases and sometimes completely severing them. This insect is found throughout the West Indies.

Of the Rhopalocera there are not many examples on the island, but among them are two of our well-known forms, the monarch butterfly (*Anosia plexippus*) and the painted lady (*Vanessa cardui*) both of which are fairly common. The three other common species are *Catopsilia eubule, Dione vanillæ* and *Junonia geneveva.*

Moths are moderately common, the Sphingids and Noctuids being best represented. Some of these are present in sufficient numbers to cause considerable damage in the larval state. Among these are the tobacco worm (*Protoparce sexta* and *P. cingulata*), while the familiar cotton worm (*Alabama argillacea*), corn ear worm (*Laphygma frugiperda*) and the boll worm (*Heliothis obsoleta*), as well as various species of "cutworms" (*Prodenia* spp., etc.), come in for their share of attention from the plantation owners. Perhaps the most common moth on the island is the pretty Arctiid *Utetheisa ornatrix*, which is particularly abundant on the high grassy flats and in open places in palm groves.

The order Diptera is well represented, and some of its more notorious members are fairly common. Both the filaria mosquito (*Culex fatigans*) and the yellow fever mosquito (*Stegomyia fasciata*) are present, the former being the more abundant. Practically all the houses of the white people and the better class of negroes are furnished with mosquito nets over the beds, although neither the doors nor the windows are screened against these or other insects. Numerous cases of the deformity known as elephantiasis or Barbados leg are to be seen among the natives, who sometimes adopt curious methods in an attempt to hide their affliction from the public.

Since there is a goodly number of brightly coloured flowering trees and plants on Barbados one naturally expects to find a large and varied hymenopterous fauna. However, he is somewhat disappointed, for the paucity of flower-visiting forms is very striking. One of the most conspicuous bees is the large bluish-black carpenter bee (*Xylocopa aeneipennis*), which builds its nest in old posts and decayed branches of trees. A still larger and reddish-brown form (*Xylocopa fimbriata*) is also quite common. Both are excellent flyers for such heavy bodied insects. Of course, the honey bee (*Apis mellifera*) is also found in some numbers, although it is not so common as with us. Of the wasps (Vespidæ) the "Jack spaniard" (*Polistes annularis*) is very common and builds its paper nests on the sides of the rocky terraces. The cow bee (*Polistes bellicosus*, is found less commonly but in similar situations. The family Formicidæ is represented by considerably the largest number of species.

Aside from the strictly entomological aspect and from the facts already mentioned, two or three items of particular interest stand out in the writer's mind as worthy of special note. Seldom is it that a tropical country is entirely free from snakes but, so far as is known, none now occur on the island of Barbados and but one small worm-like form (*Typhlops* sp.) has been able to survive the mongoose and other enemies on Antigua. Lizards are, however, extremely abundant on the trees and among the rocks and, of course, form an important natural check to the increase of noxious insects.

As the collector proceeds along his hot and dusty way he suddenly comes upon one of the dazzling white coral roads. Following this for a short distance a large iron hydrant comes into view, and soon refreshing water is to be had. These hydrants, similar in size and shape to the fire hydrants in our cities, are found along the main highways at intervals of from a mile to two miles, and are practically the only means the natives have of obtaining water which is stored in reservoirs far inland and piped to all portions of the island, except the rough Scotland district. Quite a different situation pre ails in Antigua, where practically all the drinking water is collected in great catch basins and the natives in the rural districts must carry it to their homes, sometimes a considerable distance away.

(To be continued.)

## THE IMMATURE STAGES OF THE GOLDENROD LEAF-BUG, *STRONGYLOCORIS STYGICA* SAY (MIRIDÆ, HETEROP).

BY MORTIMER D. LEONARD, ITHACA, N.Y.

During the latter part of May and the first of June, in the vicinity of Honeoye Falls, N.Y., the nymphs of a black leaf-bug are found in great abundance in patches of goldenrod, where they subsist on the leaves of this plant. Little is known concerning the life-history or the seasonal history of this insect. In 1916 on June 5, nymphs of all stages were found in a large patch of goldenrod. Those of the second stage, however, predominated, and only a few individuals in the fourth and fifth stages were present. Second and third stage nymphs were noticed as early as June 1, feeding on the tender leaves of the terminal shoots. By July 5, fifth stage nymphs predominated.

Following is a description of the several stages which the insect passes through in the course of its development. To Mr. H. H. Knight I am indebted for the determination of the species. The drawings were made from living material by the writer.

*Egg* (Fig. 1). The eggs of this species have not been found, but they are undoubtedly inserted into the more succulent portions of the goldenrod stems during late June and July, where they remain over winter and hatch the following May. On June 25, 1915, females, apparently swollen with eggs, were common. On opening the abdomen of some of these eggs, which were undoubtedly mature, were found. The description of such an egg is as follows: length 1 mm.; greatest width .27 mm.; pale yellowish or translucent, shining, cylindrical and slightly curved; somewhat compressed, and with a prominent cap which is narrowly elliptical when viewed from the top.

*Stage I* (Fig. 2). Length .93–.97 mm.; width of head including eyes .33 mm. General colour yellowish; head and thorax slightly tinged with orange or pale brownish; each of the thoracic segments with a pair of darker spots. These spots are usually faint, but vary somewhat in intensity with the individual and as to whether it is newly hatched or nearly ready to molt. Eyes reddish. Antennæ tinged with dusky; tip of first three segments often somewhat paler. Tarsi tinged with dusky. Caudal border of meso- and metathorax slightly curved backward.

*Stage II* (Fig. 3). Length 1.3 mm., greatest width (across abdomen) .6 mm. Head and prothorax blackish; the hind angles of the mesothorax and

STRONGYLOCORIS STYGICA SAY (MIRIDÆ, HETEROP).

the lateral border of the metathorax yellowish brown; a brownish yellow median line on the thorax meets a V-shaped line of the same colour on the head between the eyes. Abdomen yellowish brown with a series of darker median transverse spots in the centre of each segment, becoming successively smaller toward the caudal end; abdominal spiracles indicated by a series of small dark dots. Eyes dark reddish. Antennæ brownish yellow, tip of first three segments somewhat lighter. Legs concolorous with antennæ; femora, except tip, and tarsi darker. Caudal margin of meso- and metathorax either straight or curved slightly forward.

*Stage III* (Fig. 4). Length 1.6 mm., greatest width (across mesothorax) .7 mm. Head and thorax shining black; inner margin of eyes narrowly yellowish; a narrow, yellowish median line on thorax, which, as in the preceding stage meets a V-shaped line of the same colour on the head between the eyes. In the darker specimens this is sometimes but faintly indicated on the thorax. Abdomen dark reddish, marked as in preceding stage, except that in the darker specimens the median spots entirely overlie the ground colour. Eyes dark reddish. Antennæ pale brownish; tip of first three segments lighter. Legs dark brownish or dusky; tip of femora lighter; tarsi somewhat darker. Wing-pads becoming apparent.

*Stage IV* (Fig. 5). Length 1.8 mm., greatest width (across wing-pads) about 1 mm. Head and thorax black, somewhat shining and finely punctate. The narrow median line on thorax and V-shaped line on head in this stage are reddish. Inner border of eyes narrowly reddish. Abdomen very dark-reddish brown; posterior border of segments narrowly reddish. Eyes blackish. Antennæ grayish brown; extreme tip of first two segments lighter. Legs concolorous with antennæ; extreme tip of tibiæ lighter; tarsi darker; coxæ and trochanters pale translucent yellowish. Wing-pads reach nearly to fourth abdominal segment. Venter reddish brown. Beak brownish yellow; tip and base blackish.

*Stage V* (Fig. 6). Length 3.1 mm., greatest width (across wing-pads) 1.8 mm. Much the same as the preceding stage. There is, however, no median line on the thorax or V-shaped line on the head, and the antennæ are somewhat darker than in the preceding stage. The femora, except the tip, and the basal half and tip of the tibiæ are dark brownish. The wing-pads now reach nearly to the fifth abdominal segment.

*Adult* Fig. 7). Length 5 mm. Shining black; membrane dark brownish. Eyes dark brown. Leg markings somewhat variable but in general femora are blackish, tip brownish yellow; base and usually tip of tibiæ blackish; sometimes only base of front tibiæ black, and more or less all of middle and hind tibiæ black. Tarsi often entirely blackish, or with two basal segments somewhat paler. Beak more or less brownish. Venter shining black, nonpunctate, and in certain lights finely clothed with short golden hairs. With the exception of the genetalia there is no apparent difference in the sexes.

EXPLANATION OF PLATE XIV.

Fig. 1. Egg.
Fig. 2. First stage nymph.
Fig. 3. Second stage nymph.
Fig. 4. Third stage nymph.
Fig. 5. Fourth stage nymph.
Fig. 6. Fifth stage nymph.
Fig. 7. Adult.

# NOTES ON THYSANOPTERA FROM BRITISH COLUMBIA.

BY R. C. TREHERNE, FIELD OFFICER, ENTOMOLOGICAL BRANCH DOMINION DEPARTMENT OF AGRICULTURE.

The following notes are submitted herewith to augment our knowledge of Western Thysanoptera, a group which appears to have been sadly neglected by Canadian entomologists.

**Orothrips kelloggii yosemitii** Moulton. (Plate XV, Figs. 1–3.)

A single female of this variety was taken on Mt. McLean at Lillooet, B.C., at an altitude of about 6,000 feet, off *Amelanchier*, on July 25, 1917. I have been unable to compare this single female with specimens of *kelloggii* or of its variety *yosemitii*. From the description, however, given by Moulton (1), the the shape of the sense areas on antennal segments 3 and 4, together with the relative lengths and colours of the antennal joints, clearly place the specimen from Lillooet as belonging to the variety *yosemitii*. There are, however, certain structural features in the specimen before me which differ from the short description given by Moulton.

*Antennæ*.—The measurements of the antennal segments compare with the description with the exception of segment 4, which compares with segment 3 in length as 74 to 99$\mu$, instead of as 96 to 99$\mu$. The constriction in segment 3 is not very apparent, and the base of segment 3 is white or at least lighter in colour than the apical portion of segment 2, which is yellow. Sense areas are present on the apical portions of segments 3, 4, 5 and 6; those on segments 3 and 4 ovoid: those on segments 5 and 6 circular, with a simple transparent sense-cone protruding from each. There also appear to be two ovoid sense areas, beside each other, on segment 3, and the same on segment 4.

*Mouth Cone*.—Maxillary palpi 7-segmented, the basal joint large and as long as the remaining six segments; labial palpi 4-segmented.(2)*

*Colour*.—The colour is brown; head and prothorax darker than the remainder of the body, which is shaded with orange.

It may be seen, therefore, that despite the small variations noted, the species from Lillooet belongs to the variety *yosemitii*. Being so, it is interesting, as this record greatly extends the distribution of this insect, which so far has only been recorded from the Yosemite Valley, California.

**Æolothrips fasciatus** Linn. (Plate XV, fig. 4.)

I find in my collection two male specimens of this species; one taken off *Lithospermum pilosum* from Kelowna, B.C., on May 16, 1917; and the other off the bloom of the cultivated dahlia from Agassiz, B.C., on July 14, 1914. The latter specimen was taken in association with females of the same species and with many adults of *Frankliniella tritici*. In the literature at my disposal I have been unable to find any reference to males of *Æ. fasciatus*. For that reason I submit herewith the following description with the respective measurements of the two specimens before me.

*Æ, fasciatus*, 2 males (A and B).

Head, length .14 mm. and .14 mm., width .17 mm. and .18 mm.; prothorax, length .15 mm. and .15 mm., width across centre .18 mm. and .20 mm.; meso-

*Moulton (2) gives labial palpi 4—segmented in the key, but on pp. 45-46 gives 5—segmented in the description of the genus and species.

and metathorax length over dorsal plates .26 mm. and .22 mm., width across metathorax .28 mm. and .26 mm.; abdomen, length .84 mm. and .82 mm., width across male appendage on 9th segment .21 mm. and .21 mm.; total length of body 1.39 mm. and 1.33 mm.; antennal length .46 mm. and .37 mm.; length of segments:

| | 1 | 2 | 3 | 4 | 5 | 6–9 |
|---|---|---|---|---|---|---|
| A | 35 | 52 | 113 | 105 | 87 | 70 |
| B | 32 | 43 | 78 | 87 | 70 | 61 |

Colour, uniformly light brown, first few abdominal segments slightly lighter in colour, though blending with remainder of body; male appendage of same colour as the head, intersegmental and body pigment carmine. Antennal joint 1, concolorous with head; 2 brown shading to light brown at tip; 3 light brown at base, brown in upper half with a circle of darker brown at tip; remaining segments 4–9 brown. Legs brown concolorous with head with the exception of upper half of fore-tibiæ and fore-tarsi, which are light brown. Fore-wings banded with two brown between three white areas.

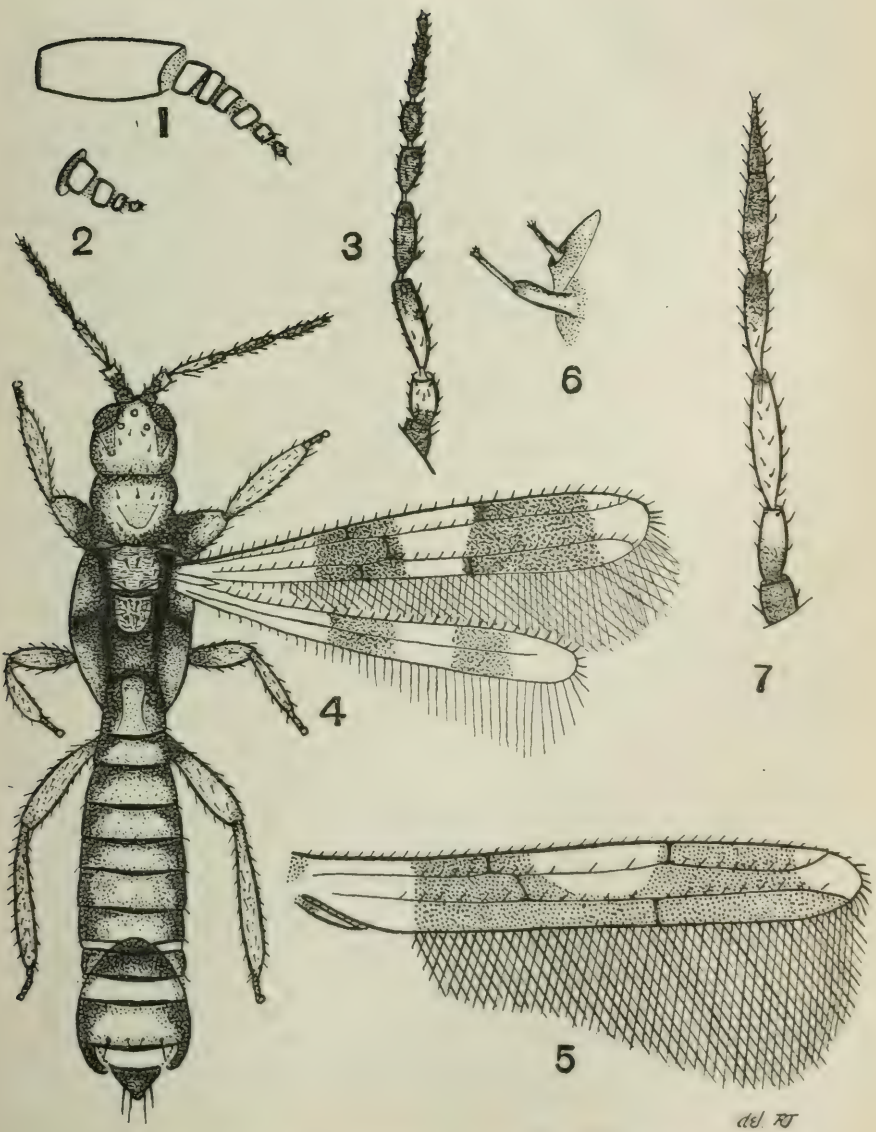
*Females* have been taken on a variety of plants of which may be mentioned *Elymus condensatus*, clover, *cratægus*, cherry, *Prunus demissa* and *Amelanchier* at various times during May, June and July 1914–1918 at Victoria, Lillooet, Agassiz, Vernon and Kelowna. The distribution of this species in the Province of British Columbia must, therefore, be widespread, inasmuch as it has been taken in localities varying from the humid to the arid. During the summer of 1918 females of this species were observed to be in association with the Onion Thrips (*T. tabaci*, upon which it is doubtless predacious, on onion foliage at Kelowna, B.C. Williams (3) records this species as predacious on the pea thrips (*Kakothrips pisivora* West) in Europe, but also notes that it feeds on pollen and plant juices (4).

**Æolothrips annectans** Hood (5).

(Plates XV, fig. 5, and Plate XVI, fig. 1.)

This species apparently occurs commonly in British Columbia. It has been taken on several occasions during May, June and July in the past three years at points in the Okanagan Valley, and in the vicinity of Victoria on Vancouver Island. It has been taken also on a variety of plants, among which may be mentioned, *Acer glabrum*, *Ribes viscosissimum*, *Sambucus racemosa*, *Ilex europæus*, apple, alder, *Lithospermum pilosum*, *Amelanchier florida*, and in sweeping through general vegetation. Possibly the most notable record of its presence in numbers was observed in Kelowna, B.C., during early July (1918) in commercial onion plantations, where many specimens were seen associated with and doubtless predacious upon the onion thrips (*T. tabaci*). Mr. J. D. Hood, to whom some British Columbia specimens were submitted, agreed that my "determination was correct, though a remarkable addition to its known distribution," (April, 1918). According to my information this species thus far has only been recorded from Maryland, Virginia and New York State, U. S. A. (6).

Eleven specimens before me clearly agree with the account given by Hood (5). The presence of slight transverse striations across the occiput constitutes




BRITISH COLUMBIA THYSANOPTERA.

the only main difference from the published description. The fore-wings are shaded as described, but in addition have their extreme basal portions, (scale and fore-wing), shaded brown-gray. The measurements of the British Columbia specimens may be briefly given as follows:

Head, length .15 mm., width across occiput .19 mm.; prothorax, length .15 mm., width at centre .22 mm.; total length of body, 1.7 mm–1.8 mm.; fore-wing, length .94 mm.–1.01 mm.; antennæ, length .40 mm.–.42 mm.; antennal segments, length:

| Segment | 1 | 2 | 3 | 4 | 5 | 6–9 |
|---|---|---|---|---|---|---|
| Length | 30 | 52 | 105–122 | 87–96 | 70 | 52 |

In addition, the following notes are added to the description already given by Hood:

*Fore-wings.*—Cross-veins present; two cross-veins connecting anterior ring vein to first longitudinal vein, one connecting the two longitudinal veins, one and (apparently) sometimes two connecting second longitudinal vein to posterior margin of wing; spines on anterior margin of ring vein 37–41, on first or anterior longitudinal vein 13–16 (arranged 6–8 brown, 2–3 white, 4–6 brown), on second or posterior longitudinal vein 19–21 (arranged 1 white, 18–20 brown); on scale 5–6 on anterior margin and one central. The two wings of the same specimen often vary in the matter of alar spines.

*Maxillary palpi.*—3-segmented, geniculate, basal joint twice as broad and nearly twice as long as the middle joint, apical small; labial palpi 4-segmented, basal joint as long as the remainder.

### **Æolothrips auricestus,** new species.

(Plate XV, figs. 6, 7, and plate XVI, fig. 2.)

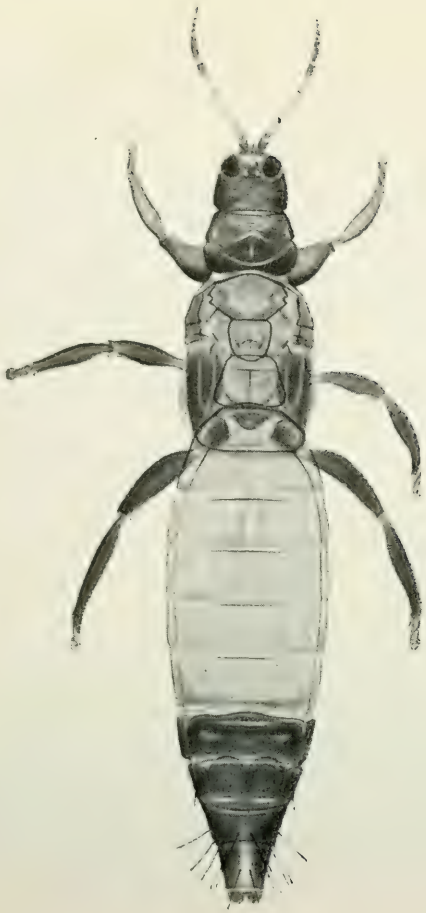
I am indebted to Mr. J. D. Hood, of the United States Biological Survey, for confirming my belief, that this species has not been previously described.

*Measurements.*—Head, length .18 mm., width across occiput .21 mm.; prothorax, length .18 mm., width .22 mm.; mesothorax, length .24 mm., width .35 mm.; abdomen, length 1.48 mm. Total length of body about 2.08 mm.; antennæ, total length .44 mm.; antennal lengths:

| Segment | 1 | 2 | 3 | 4 | 5 | 6–9 |
|---|---|---|---|---|---|---|
| Length | 35 | 61 | 113–122 | 87–91 | 70 | 70 |

*Colour.*—Brown; head slightly darker brown than other parts of the body; antennal segment 1, brown; 2, brown at base (at times light brown at base) shading to white at tip; 3, creamy-white with a circle of brown at tip; 4, pale-brown at base shading to brown at tip; remaining segments similar to segment 1. Legs brown, fore-legs lighter; fore-tibiæ and tarsi light-brown; abdomen segments 2–6 golden-yellow, last four segments brown, segment 1 light brown shading to yellow on posterior half. Fore-wings banded, with two brown areas between three clear white ones, each area of about equal width. Hind wings banded, similar to the fore-wings, but the bands of brown are pale and indistinct. Scale shaded brown at base.

*Head.*—Slightly wider than long, about equal in length to the prothorax, slight transverse striations across occiput, covered with numerous small spines;



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eyes large, on ventral surface extending rather more than half way the length of the head, coarsely faceted and sparsely pilose; ocelli three, conspicuous, the posterior pair contiguous with the inner margins of the eyes; mouth-cone reaching into the posterior third of the prothorax; maxillary palpi 3-segmented, geniculate, basal joint twice as broad and nearly equal in length to the middle joint, apical small; labial palpi 4-segmented, three apical joints slightly longer than basal joint; antennæ 9-segmented, about two and one-half times as long as the head, all segments clothed with numerous short spines, those on segments 1 and 2 fewer and stouter, spines on all segments about equal in colour to the segments upon which they are placed; sense areas on apical portions of segments 3, 4 and 5, being respectively elongated and inconspicuous, elongated and conspicuous, oval and conspicuous.

*Prothorax*.—Slightly wider than long, about equal in width and length to the head, emarginate midway on each lateral margin, the dorsal surface clothed with numerous stout spines. *Mesothorax* wider than prothorax, mesoscutum striate-reticulate, with eight prominent spines. *Metathorax* narrower than mesothorax, metascutum reticulate, with four spines on dorsal surface. *Legs*, front femora thickened, slightly lighter in colour to femora of middle and hind legs, all tibiæ armed at apex, those spines on hind tibiæ much the strongest, hind tibiæ with 8–10 stout spines on inner margin, each fore-tarsus armed with a stout hook, which is yellow, and a tooth, which is shaded brown. *Fore-wings* reaching to about the eighth abdominal segment, rounded at tip, cross-veins present, no cross-vein apparent connecting the second longitudinal vein with the posterior ring vein, five to eight minute spines on each brown area on the anterior longitudinal vein, and six to eight on each brown area on the posterior longitudinal vein, right wing often varying from the left wing in the matter of alar spines, all spines equal in colour to the portion of wing upon which they are placed; scale with one central spine and six to eight inconspicuous spines on anterior margin. *Hind wings* with a short spine-like fringe on anterior margin reaching from basal fourth to tip, simple fringe along the posterior margin. *Abdomen* elongate-ovate, conspicuous spines only on the ultimate and penultimate sgments.

Described from 9 macropterous females, taken by the author from the Western Wild Rye grass, *Elymus condensatus*, at Vernon and Kelowna, British Columbia, in July, 1917. Brachypterous forms also occur in association with the macropterous forms. Their body characters agree with the above account.

The type and cotype have been placed in the collection of the National Collection of Insects, Department of Agriculture, Ottawa, Canada. Paratypes are also retained in the collection of the author.

**Taeniothrips inconsequens** Uzel. (The Pear Thrips.) Plate XVII.

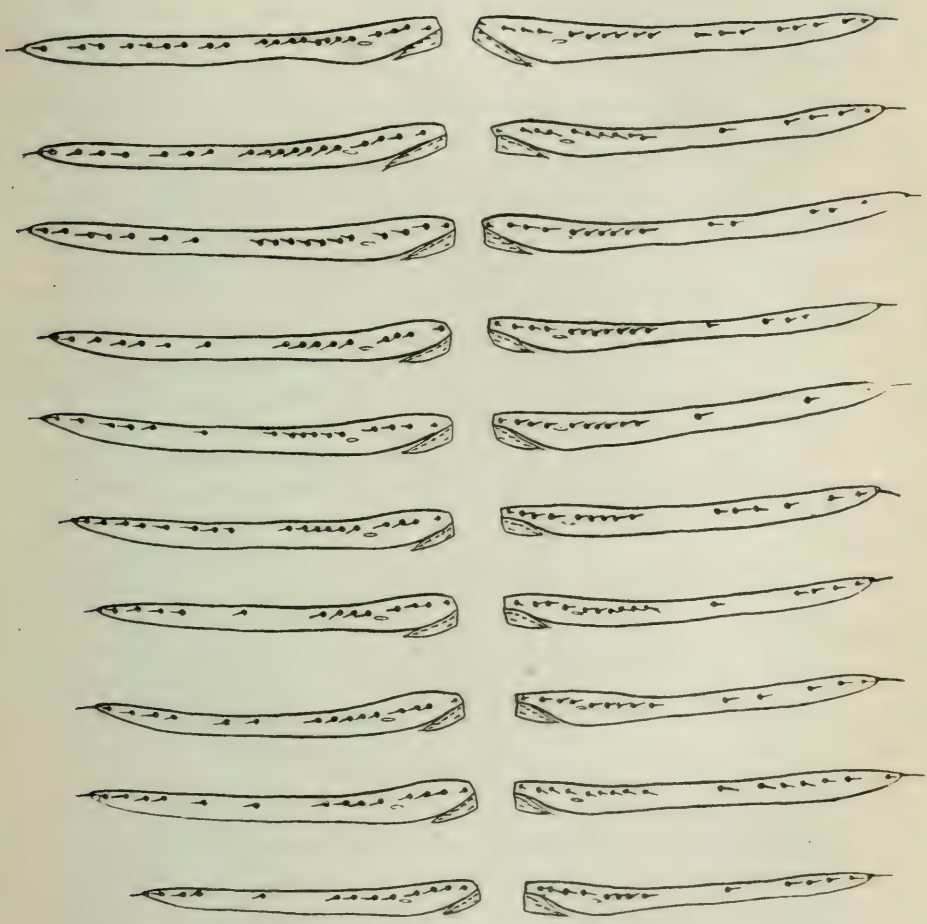
During the course of a two-year's study (1916, 1917) of the pear thrips *Taeniothrips (pyri* Dan) *inconsequens* Uzel. on the Pacific coast of British Columbia, a number of variable points in the external anatomy became apparent following the close examination of a large number of specimens. Early in the study it was apparent that the spines upon the wing, both as regards numbers and position, represented too variable a character alone to certify its specific identity. This observation led to a close examination of the essential specific

characters of the species, and the results of this study are recorded herewith, supplementing the description already given by Moulton (2).

*Head.*—Width across the occiput .15 mm., across the eyes .13 mm.; length 3. mm.; slightly wider than long; cheeks arched; occupit transversely striate, bearing eight minute spines immediately posterior to the compound eyes; a pair of very prominent spines between the posterior ocelli, situated within the margins of the pigmented ocellar crescents; a single minute spine, on each side, near the margin of the compound eyes, in a lateral direction from the anterior ocellus; vertex smooth; compound eyes, prominent, oval in outline black with light borders, coarsely faceted and slightly pilose; ocelli approximate yellow, margined inwardly with orange-brown crescents, posterior ones approximate to but not contiguous with the light inner borders of the eyes. Mouth-cone pointed, tipped with black, maxillary palpi three-segmented, each segment about equal in length, the second shortest and the third longest; labial palpi two-segmented, basal segment very short. Antennæ eight-segmented, about two and one-half times the length of head (.32 mm.); spines on all segments pale; a forked sense area on dorsal surface of segment 3, with a similar area on ventral surface of segment 4, with a pair of moderately stout spines immediately beneath each area; whorls of minute inconspicuous hairs on posterior portions of segments 3 to 6. Antennal lengths, segment 1, 33$\mu$ to 36$\mu$; 2, 42$\mu$ to 47$\mu$; 3, 63$\mu$ to 64$\mu$; 4, 54$\mu$ to 64$\mu$; 5, 33$\mu$ to 42$\mu$; 6, 57$\mu$ to 66$\mu$; 7, 9$\mu$ to 10$\mu$; 8, 12$\mu$ to 13$\mu$. Total length .30 mm. to .34 mm.

The head characters, thus given, are apparently stable, and represent the typical formation. Three prominent spines of equal and normal length may, however, at times, be found between the posterior ocelli. Variations in the antennæ are frequently met with, but these may be classed as distinct deformities. They often take the form of a reduction in the number of segments from eight to seven or six, either by the fusion of two segments or by the complete elimination of certain segments.

*Prothorax*, length .13 mm.; breadth .2 to .25 mm.; as long as head, but wider; dorsal surface smooth; sides slightly arched; a weak spine anteriorly-directed on the anterior angles; a pair of large, strong spines on the posterior angles; from twenty-eight to thirty-six spines scattered over the dorsal surface, all small and inconspicuous, except a central moderately stout pair on the posterior margin and a single one, of equal strength, on each side, situated immediately cephalad of the stout pair in the posterior angles. *Mesothorax*, sides evenly convex, angles rounded; scutum (mesonotal plate) striate. *Metathorax*, scutum and scutellum (metanotal plates) faintly striate; four spines along anterior margin of scutum, the inner two the largest. *Legs* moderately long; spines on tip of fore and middle tibiæ weak; hind tibiæ furnished with a row of seven to nine strong, light-brown spines and a pair of stout spines borne at the tip of each tibia; tarsus furnished with one comparatively stout light-brown spine near the base, and a few pale ones. *Wings* present, extending slightly beyond the tip of abdomen, about twelve times as long (1 mm.) as wide; pointed at tips; colour very slightly tinted light-brown; costal vein thickly set with from twenty-three to thirty-three long spines; costal fringe twice as long as costal spines; fore-vein with twelve to twenty-two spines arranged in groups. On the basal half of wing, on the fore-vein, a single small spine, followed by a



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group of three spines, followed by a variable group of not less than four and as many as eight spines; on the distal half of wing the spines of the fore-vein are exceedingly variable, both as regards numbers and disposition; hind-vein with twelve to eighteen regularly placed spines; scale five spines; interior of scale one spine.

It may be shown, also, that it is the exception, not the rule, to find the two wings of the same specimen equal as regards length of wing, or number and disposition of alar spines. Almost invariably the two wings are dissimilar in some respect. Plate XVII represents outline camera lucida sketches of the right and left wings of ten typical specimens. Rather more than half of the wings examined (59 per cent.) showed the basal portion of the fore-vein with spines "arranged in two groups of 3 to 6, respectively," whilst 28 per cent. were arranged in two groups of 3 and 5, 7 per cent. in 3 and 7, 5 per cent. in 3 and 4, and 1 per cent. in 3 and 8. These figures, indicating the differences that are liable to occur plainly, show that the wing characters are of minor value in the quick and ready examination for the determination of the species.

*Abdomen* sub-ovate; 10-segmented, tapering abruptly toward the tip from the eighth segment. Dorsal surface of segment 2 to 8 with from eight to ten spines on each segment, the most prominent being on the lateral margins; posterior margin of segment 8 with a fine comb-like structure consisting of from thirty-eight to forty-four teeth; segments 9 and 10 with about ten of the longest and most prominent spines of the body. *Total length* from tip of vertex to tip of abdomen about 1.26 mm. *Colour*, head, thorax and abdomen uniformly dark-brown with connective tissue between segments of the abdomen, the tarsi and tibiæ shading from light-brown to yellow. Segment 3 of the antennæ light brown.

The wings though slightly tinted with light-brown, when resting over the back, appear, to the naked eye, to be grey in comparison to the dark-brown of the abdomen. Many light coloured specimens, especially those forms which have recently emerged from the soil in the spring, may be frequently observed; this colour difference, however, may be preserved throughout the life of the adult.

### **Thrips physapus** Linn.

This species is common in British Columbia, under arid and humid conditions, and may be found throughout the entire season. It has been taken commonly off dandelion at Vernon and near Victoria during early April and May, as well as off *Rubus parviflorus* flowers during June in Vancouver, and recently it has been found in the blooms of partly frozen garden flowers, during December. Carpenter (7) before the Royal Dublin Society in 1900 and again in 1901, draws attention to this species as being destructive to the blossoms of the pear near Dublin, Ireland, causing a failure in the fruit crop. In British Columbia, in localities frequented by *Taeniothrips inconsequens*, *Thrips physapus* also is found to occur, often in similar positions on like plants, frequently associated in the same blossom.

### **Thrips tabaci** Lind.

The adults of this species are known as the "Onion thrips" in British Columbia. The species undoubtedly occurs on a wide range of plants, and is

known to cause considerable commercial loss in onion plantations in the "dry belt" of the Province. First generation larvæ developing from eggs laid by overwintering specimens become first apparent in early June in the Okanagan Valley. This species also occurs on Vancouver Island.

**Haplothrips statices** Hal.

This species has been beaten from the branches and foliage of cultivated apple and plum trees, *Spiræa discolor*, and other native shrubs at Victoria on Vancouver Island and at Vernon, B.C. It appears to be the commonest species infesting the flower heads of clover, having been observed in great numbers in such plants, both at Vernon and Penticton, B.C. This insect has been recorded from many widely separated points, including, on the west, Oregon and California (8). From Montana (9) we receive information that this species has been proven destruction to the set of red-clover seed. Judging from the numbers that this species occurs in the clover heads, particularly in the "dry belts" of the Province of British Columbia, it is possible that some injury, not as yet proven, may be caused.

**Leptothrips mali** Fitch.

I am indebted to Mr. J. D. Hood for establishing the correct identity of both a nymph and an adult of this species. With this assistance I am able to offer the following few additional notes on the habits of the species:

A colony of twelve adults was taken clustering in the empty burrow of some solitary burrowing hymenopteran in a dead twig of an Olivet cherry tree at Okanagan Falls, B.C., on April 10, 1918. It was evident that these insects, which were a few inches from the entrance of the burrow, had hibernated in this position. They were observed first on splitting the twig lengthwise.

On August 27, 1917, a group of 5 nymphs and 2 females of this species were taken off the gummy exudation caused by the larva of *Anarsia lineatella* on a peach tree at Penticton, B.C. They were apparently feeding on the exudate. Specimens of individual adults have been taken at various times during May, July and July off the foliage and branches of *Acer glabrum*, alder, amelanchier, apple, peach and cratægus, at points in the Okanagan Valley between Vernon and Vaseaux Lake, Lillocet, and near Victoria on Vancouver Island.

As recorded by Hood (8) this species is widespread in its distribution and common "from early spring to late fall." He states that for the most part this species lives "singly on the leaves of various trees." This agrees entirely with the majority of the records noted above. It is only necessary to add that, apparently, adults cluster for hibernation purposes, and that nymphs may, at times, be found closely assembled at one place.

**Chirothrips manicatus** Hal.

Males and females of this species occur commonly at the Coast, and in the Interior of British Columbia on many roadside grasses.

I wish in conclusion to thank Mr. J. D. Hood, of the United States Biological Survey, for the assistance he has given me in this group of insects. Furthermore, my thanks are due to Mr. Warburton Young, of the Health of Animals Branch, Dominion Experimental Farm, Agassiz, B.C., for his drawings of *Æ. auricestus* and *Æ. annectans*.

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EXPLANATION OF PLATES.

PLATE XV.

Fig. 1. *Orothrips kelloggii yosemitii*, maxillary palpi.
Fig. 2. *Orothrips kelloggii yosemitii*, labial palpi.
Fig. 3. *Orothrips kelloggii yosemitii*, right antenna.
Fig. 4. *Æolothrips fasciatus*, male.
Fig. 5. *Æolothrips annectans*, right wing.
Fig. 6. *Æolothrips auricestus*, n. sp., maxillary and labial palpi.
Fig. 7. *Æolothrips auricestus*, n. sp., left antenna.

PLATE XVI.

1. Brachypterous female of *Æolothrips auricestus*, n. sp. (drawn and painted under author's instruction, by Mr. C. W. Young, Agassiz, B.C.).

2. Macropterous female of *Æolothrips annectans* Hood, (drawn and painted under author's instruction, by Mr. C. W. Young, Agassiz, B.C.).

PLATE XVII.

Variations in alar armature of fore-wing of *Tæniothrips inconsequens* (diagrammatic, author's illustration).

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## APPOINTMENTS—CANADIAN ENTOMOLOGICAL BRANCH.

Mr. Leonard S. McLaine, M.Sc., of the Canadian Entomological Branch, has been transferred from the Dominion Entomological Laboratory, Fredericton, N.B., to Ottawa, and has been appointed Chief of the Division of Plant Inspection and Executive Assistant to the Dominion Entomologist. As Chief of the Division of Plant Inspection, Mr. McLaine will have immediate charge of the work of inspection and fumigating imported nursery stock, and of the field work against the Brown-tail Moth in Eastern Canada, and such other duties as the enforcement of the insects and pests regulations under the Destructive Insect and Pest Act may involve.

Mr. M. B. Dunn, Temporary Assistant at the Dominion Entomological Laboratory at Fredericton, N.B., has been appointed an Entomological Assistant in the Division of Forest Insects of the Entomological Branch, Ottawa, and under the direction of Dr. J. M. Swaine he will be assigned to sample plot investigations in the forests of Quebec and Ontario.

# NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA) PART VIII.

BY CHARLES P. ALEXANDER, URBANA, ILL.

As in the other papers of this series, the types of the new species are deposited in the collection of the writer, unless stated otherwise.

## Genus *Dicranoptycha* Osten Sacken.

**Dicranoptycha sobrina quadrivittata,** new subspecies.

*Female.*—Length 10 mm.; wing 10.5 mm.

This variety is similar to typical *sobrina*, differing as follows:

Mesonotal præscutum gray, more yellowish on the disk, clearer gray along the margin; four distinct dark brown stripes, the median pair longest, indistinct in front, clearer behind, lying parallel and separated from one another only by a capillary gray line. Tuberculate pits distinct, close together, lying just before the level of the pseudosutural foveæ, separated from one another by a distance a little less than the diameter of one. Pseudosutural foveæ very pale, elongate, linear. Lateral stripes short. Scutal lobes dark brown. Pleura grayish above, paler ventrally. Coxæ whitish. Wings gray; veins dark brown; wings very long and narrow; *Rs* shorter than cell *1st* $M_2$, almost square at its origin and running close to *Ri*; *Sc* ends just before the fork of the sector. Abdominal tergites uniformly dark brown.

*Habitat.*—Colorado.

*Holotype.*—♀, Peaceful Valley, Colorado, August 25, 1917, (T. D. A. Cockerell).

This species was included in some interesting crane-fly material kindly sent me for study by Prof. Cockerell. It is very different in the details given above from the extensive series of typical *sobrina* in my collection. More material will be needed to determine the true status of the fly.

## Genus *Molophilus* Curtis.

**Molophilus squamosus,** new species.

Antennæ of the male short; general coloration dark gray; male hypopygium with the dorsal pleural appendage flattened, very broad, the dorsal face roughened; ventral pleural appendage a powerful black arm that is acute at the tip, which is bent ventrad.

*Male.*—Length 3.2–3.4 mm.; wing 4.7–5 mm.

Rostrum and palpi dark brown. Antennæ of the male short, dark brown throughout. Head gray.

Pronotum dark brown medially, yellowish laterally. Mesonotum gray, the humeral angles paler; scutelum yellowish; postnotum brownish gray. Pleura grayish. Halteres yellow, the knobs a little darker. Legs with the coxæ, trochanters and base of the femora yellowish; remainder of the legs brown. Wings whitish subhyaline; veins dark brown; a very indistinct darker clouding along the cord at *r*, *r-m* and the basal deflection of $Cu_1$. Venation: deflection of $R_{2+3}$ short, subperpendicular, shorter than the basal deflection of $Cu_1$; fusion of $Cu_1$ and $M_3$ very long, much longer than $Cu_1$ beyond the fork.

Abdomen dark brown, the posterior margins of the tergites yellowish, broader on the terminal segments; hypopygium grayish brown. Male hypopygium with each half of the tergite contiguous or overlapping at the tips. Dorsal pleural appendage lying transversely, the tip directed proximad and dorsad,

very broad and flattened with the dorsal surface minutely roughened into tiny spines or raised scales that are more prominent, subserrate, along the outer margin. Ventral pleural appendage powerful, acute, shiny black, straight basally, suddenly narrowed to the acute tips which are directed ventrad, the concave face weakly toothed.

*Habitat.*—California.

*Holotype.*—♂, Alpine, San Diego County, California, April 9, 1915, (M. C. Van Duzee).

*Paratopotype.*—Sex uncertain.

The type is in the collection of Mr. Van Duzee.

Additional specimens of a closely related form from the Muir woods, Marin County, California (May 19, 1915, M. C. Van Duzee) agree closely with this species in general characters, but are much more reddish in their general colour, the dorsal pleural appendage not so broad, and the ventral pleural appendage with about three or four large spinules before the tip. *Molophilus squamosus* is a small, delicate species, allied to *M. paulus* Bergroth, but readily distinguished by the very broad, dorsal pleural appendages and the differently constructed ventral appendage. From *M. spiculatus* Alex., *M. comatus* (Doane) and other allied forms it is told by its much smaller size and slightly different structure of the male hypopygium.

**Molophilus bispinosus,** new species.

Antennæ of the male short; general coloration light brown; male hypopygium with the lobes of the ninth tergite produced apically into straight, slender arms; dorsal pleural appendage elongate, very straight and slender, acute at the tip; ventral pleural appendage powerful, sickle-shaped, the concave face with strong spinules.

*Male.*—Length about 4 mm.; wing 5.5 mm.

Rostrum and palpi brown. Antennæ of the male short, the scape brownish yellow, the flagellar segments dark brown, clothed with a long pale pubescence. Head with the front yellow, vertex and occiput gray.

Pronotum pale. Mesonotum light brown, the tuberculate pits black, widely separated. Pleura grayish brown. Halteres pale. Legs brownish yellow, the tips of the tarsi darkened. Wings subhyaline; a faint blotch of dark hairs on the radial cross-vein and another on the radial-median vein; a faint cloud at the basal deflection of $Cu_1$; veins dark brown, subcosta yellow. Venation: basal deflection of $R_{4+5}$ and *r-m* in alignment; fusion of $Cu_1$ and $M_3$ a little shorter than $Cu_1$ beyond the fork.

Abdomen dark brown, the hypopygium reddish yellow. Male hypopygium with the tergite profoundly split medially as in the genus, the halves thus formed with the tips rather narrow, directed proximad so as to be almost contiguous on the median line; each lobe on the sides at the apex produced caudad into a slender, flattened, straight, fleshy lobe whose inner margin is fimbriate. Dorsal pleural appendage slender, elongate, almost straight beyond the enlarged base, the tips acute. Ventral pleural appendage powerful, strongly curved, the subacute apex directed ventrad, the ventral or concave face with several equidistant large and acute spinules.

*Habitat.*—California.

*Holotype.*—♂, Berkeley, California, May 25, 1915, (M. C. Van Duzee).

GENUS *Gnophomyia* OSTEN SACKEN.

**Gnophomyia tristissima cockerelli,** new subspecies.

*Female.*—Length about 8.5 mm.; wing 7.2 mm.

Similar to typical *tristissima*, differing as follows: Antennæ a little longer. Legs somewhat stouter. Wings hyaline, with a few dark seams along the veins, these seams on *Rs*, $R_{4+5}$, *M*, *Cu*, $M_3$ and *second A;* cell *Sc* dark. Venation: *Sc* ending beyond the fork of *Rs;* $Sc_1$ long, about equal to $R_{2+3}$.

*Habitat.*—Colorado.

*Holotype.*—♀, Campus of the University of Colorado, Boulder, Colorado, September 20, 1917, (Felicita Claer).

The distinctly bicolorous, longitudinally streaked, wings is the most conspicuous character to separate this fly from typical *tristissima* O. S. of the eastern United States, in which the wings are uniformly darkened. The type was kindly sent me by Prof. Cockerell, to whom the form is respectfully dedicated. In the collection of the United States National Museum there are a few specimens of this variety, likewise from Colorado (from the collection of C. V. Riley, taken by Morrison).

GENUS *Gonomyia* MEIGEN.

**Gonomyia (Gonomyia) aciculifera,** new species.

Belongs to the *noveboracensis* group; similar to *noveboracensis* Alex. but larger; wings with *Sc* shorter and with $Sc_2$ at the tip of $Sc_1$; $R_2$ not so close to $R_1$ at the wing margin; male hypopygium with the ventral pleural appendage expanded at the apex into a paddle-like blade whose lower margin is minutely toothed.

*Male.*—Length 5 mm.; wing 5.4 mm.

Described from an alcoholic specimen.

Rostrum and palpi entirely dark brown. Antennæ dark brown throughout, the basal segments enlarged. Head dark.

Mesonotum dark, the humeral angles a little brighter. Pleura brownish, brighter posteriorly. Halteres elongated, pale, the knobs dark. Legs with the coxæ dark, the trochanters a little paler; remainder of the legs broken. Wings pale grayish yellow; stigma indistinct; veins light brown. Venation: *Sc* rather short, ending far before the origin of the sector, the distance between the two only a little less than the length of the basal deflection of $Cu_1$; $Sc_2$ very close to the tip of $Sc_1$ and about subequal to it; *Rs* strongly arcuated; $R_{2+3}$ very long as in this group of species, almost straight beyond the origin; $R_2$ semiperpendicular, short, the distance on the wing margin between the tips of veins $R_1$ and $R_2$ is a little greater than $R_2$ alone; cell $R_2$ a little larger than in *noveboracensis;* $R_{4+5}$ straight, not approaching $M_{1+2}$ at the wing margin; basal deflection of $Cu_1$ at the fork of *M*.

Abdomen dark, the posterior margins of the tergites paler. The colours produced by pruinosity in dried specimens are undoubtedly somewhat different from those of the alcoholic type just described. Male hypopygium similar to that of *noveboracensis* (as figured in the Proceedings of The Academy of Natural Sciences of Philadelphia for 1916, Pl. 30, Figs. 79 and 80), but differing in many important respects; the flattened dorsal pleural appendages have but few setæ along the truncated or concave apex; the long, slender, ventral arm is expanded into a paddle at the tip, this with the lower margin minutely

denticulate, the teeth coarser proximally but very minute and delicate on the distal two-thirds of the blade. The tubercle at the dorsal inner edge of the pleurite bears three very long bristles that are but little shorter than the dorsal pleural appendage. The gonapophyses and penis-guard are fused into a subcylindrical tube that is armed caudally with several needle-like points. The arrangement of these chitinized horns is about as in *noveboracensis*, but their shape and structure is very different; appendage *b* is almost straight and has the two arms of the bifid tip very unequal, the shorter one appearing as a small spine at about mid-length of the appendage; appendage *c* appears forked at its very base, the one arm very stout basally, near the apex narrowed and strongly curved; the other fork is shorter, gradually pointed and flattened to the tip, the margin with a thin line of hairs. Below (ventrad of) the tube on either side is a very large, flattened, nearly hyaline plate that is almost invisible in balsam.

*Habitat.*—California.

*Holotype.*—♂, Wildcat Cañon, San Pablo, California, September 16, 1906, (J. Chester Bradley).

The type is in the collection of Cornell University.

The only described Nearctic species that is close to *G. aciculifera* is *G. noveboracensis* Alex. (Can. Ent., Vol. 48, pp. 319, 320; 1916) of the northeastern United States. The wing venation and the structure of the male hypopygium will easily separate the two forms. In this group of species, the male hypopygium is very complicated in structure, and I am unable to correlate the remarkable structures that surround the penis-guard, with the gonapophyses found in other groups of the genus. Very few specimens of these two species have yet been discovered, and more material is needed to finally decide these homologies.

GENUS *Tricyphona* ZETTERSTEDT.

**Tricyphona petiolata,** new species.

Size very small; antennæ dark brown, with fifteen evident segments, those toward the tip small and nearly globular; general coloration light buff, the mesonotum with a single conspicuous median dark brown stripe; wings nearly hyaline; cell $R_3$ petiolate; $R_2$ perpendicular, at the very tip of $R_1$; cell $M_1$ lacking; cell *1st* $M_2$ open by the atrophy of *m;* abdomen brown, the hypopygium conspicuously light yellow.

*Male.*—Length about 5.5 mm.; wing 6 mm.

Rostrum and palpi dark brownish black, the former very short. Antennæ dark brownish black, with fifteen evident segments, short, the first segment elongate, the second enlarged, globular, the first flagellar segment elongate ova ; those toward the end of the organ smaller and subglobular; the last segment is elongated and constricted medially as though formed by the close approximation of two small segments. Head brownish gray.

Pronotum buffy, broadly dark brown medially. Mesonotum light buffy yellow, the præscutum with a single broad, dark brown median stripe that is narrowed at the tip and becomes obliterated before the suture; lateral præscutal stripes lacking. Pleura buffy yellow. Halteres pale basally, the knobs dark-brown. Legs with the coxæ buff; trochanters light yellow; femora brown, paler basally; tibiæ and tarsi dark brown. Wings nearly hyaline, narrow; stigma lacking; veins yellowish brown. Venation: *Sc* long, ending slightly

beyond the fork of $R_{2+3+4}$; *Rs* short, oblique, almost straight; $R_{2+3+4}$ variable in length, in one wing shorter than the basal deflection of $Cu_1$, in the other a little longer; $R_2$ (the apparent *r* cross-vein; see Alexander; A New Interpretation of the Wing-venation of the Pediciine Crane-flies, Ent. News, Vol. 29, pp. 201–205, pl. 12; 1918) inserted at the extreme tip of $R_1$, perpendicular; cell $M_1$ lacking; cell *1st* $M_2$ open by the atrophy of *m;* petiole of cell $M_3$ nearly equal to the basal deflection of $Cu_1$.

Abdomen dark grayish brown, the subterminal segments a little darker; hypopygium conspicuously light yellow.

*Habitat.*—Colorado.

*Holotype.*—♂, Peaceful Valley, Colorado, August 25, 1918, (T. D. A. Cockerell).

This interesting little fly is to all appearances a *Rhaphidolabis* of the subgenus *Plectromyia*, but the number of antennal segments precludes it from that group, and until more material is available I prefer to consider it a *Tricyphona* to where it will run by the keys. There are only fifteen distinct antennal segments, but the terminal one is evidently formed by the close approximation of two very small segments. The fly somewhat resembles a very small specimen of *Rhapidolabis major* Alex., but the size and venation, especially the position of $R_2$ and the lack of cell $M_1$, easily separate the two.

GENUS *Liogma* OSTEN SACKEN.

**Liogma nodicornis flaveola,** new subspecies.

*Male.*—Length 12 mm.; wing 8.3 mm.

*Female.*—Length 11 mm.; wing 9 mm.

This variety is similar to typical *nodicornis*, but is much more yellowish throughout. Compared with specimens of typical *nodicornis*, the following differences are apparent:

Antennæ light brown. Mesonotal præscutum with the ground colour yellowish brown with the three brown stripes rather narrow and scarcely confluent; scutal lobes only indistinctly darker; mesonotal postnotum yellowish with only the terminal third blackish. Pleura mostly yellow, a small, circular, dull black area on the mesepisternum behind the fore coxa. The extensive shiny black areas on the mesosternum before the middle coxa are not continuous across the midventral line. Abdomen pale brown.

*Habitat.*—Virginia.

*Holotype.*—♂, Great Falls, Virginia, May 19, 1915.

*Allotopotype.*—♀, June 7, 1915.

The northern *L. nodicornis nodicornis* (O. S.) is easily told from the pale yellowish southern race above diagnosed by its much more extensive black thoracic pattern. In the type-material of typical *nodicornis*, both varieties are represented. As typical of *nodicornis* in the strict sense the writer selects the lectotype from the material taken in the White Mts., New Hampshire.

GENUS *Tipula* LINNÆUS.

*Tipula doaneiana*, new name.

*Tipula californica* Doane (1912), non *Tipula californica* (Doane) (1908).

In 1908, Doane described under the name *Pachyrhina californica*, a species of crane-fly that both Dr. Dietz and the writer now refer to the pachyrhinoid series of the genus *Tipula*. Dietz (1918), under the misconception that it was

the 1908 name that was preoccupied, renamed this species *Tipula xanthomela*. The 1912 species is here renamed as above in honour of Prof. R. W. Doane.

**Tipula ludoviciana,** new species.

Belongs to the *tricolor* group; closely related to *T. sayi* Alex. (*costalis* Say); male antennæ very long, bicolorous; wings with a dark costal margin, beneath which is a vitreous streak; a narrow, brown seam along vein *Cu*.

*Male*.—Length about 13.5–14 mm.; wing 11.5–11.8 mm.; antennæ about 13–13.5 mm. Hing leg, femur 9.3 mm.; tibia, 11 mm.

*Female*.—Length about 12 mm.; wing 11.4 mm.

*Male*.—Frontal prolongation of the head moderately elongated, light brown, the nasus slender. Mouth-parts and palpi dark brown. Antennæ exceedingly elongate, approximately as long as the entire body, the scape light brown, the flagellar segments with the basal swelling dark brown, the pedicel light yellow, on the terminal segments more infuscated; the pedicel of the intermediate flagellar segments is six times as long as the basal enlargements; in addition to the usual black verticils, the segments are provided with a delicate pale pubescence that is easily removed. Vertical tubercle prominent, entire. Head dark with an indistinct darker median line.

Mesonotum brown, probably more or less gray pruinose in dry material, the præscutum with three very broad, dark brown stripes; postnotum pale, margined with brown. Pleura pale, probably more or less pruinose in life, with indistinct dark markings on the mesopleura, and dark brownish black on the mesosternum between the middle and hind coxæ. Halteres slender, brown. Legs with the coxæ largely pale; trochanters yellowish, dark brown apically; femora and tibiæ brown, darkest apically; tarsus brown. Wings gray, the costal region dark brown, this including cells *C*, *Sc*, *1st* $R_1$, *2nd* $R_1$, the anterior portion of *R*, and the outer end of $R_2$; a broad brown seam along vein *Cu* occupying the space between that vein and the weak degenerate anal vein immediately behind it; a vitreous longitudinal stripe behind the brown costal margin, this including the posterior portion of cell *R*, the anterior portion of *M*, and the base of cells $R_3$ and $R_5$; veins dark brown. Venation: *m-cu* short but distinct; petiole of cell $M_1$ about as long as cell *1st* $M_2$.

Abdominal tergites light brown, the transverse impressed areas on either side near the base of the segments very distinct, black; sternites paler. Male hypopygium small, compressed, as in the *tricolor* group, with the sclerites fused into a continuous ring. Ninth tergite with the median lobe very depressed, broad, the posterior margin with a very flattened, V-shaped notch which is black and roughened; no pencil of hairs on the sides of the median lobe. Outer pleural appendage oval, flattened, pale, with sparse black hairs; inner pleural appendage simple in structure. Ninth sternite carinate. Eighth sternite unarmed.

*Female*.—Similar to the male; antennæ short, much darker coloured than in the male; ovipositor with the tergal valves long, slender, straight; sternal valves short, very compressed, the tips subacute.

*Habitat*.—Louisiana.

*Holotype*.—♂, Morgan City, Louisiana, June 18, 1917, (Cornell University Expedition, Lot 542, sub. 16).

*Allotopotype*.—♀.

*Paratopotypes.*—2 ♂'s.

The type is in the collection of Cornell University.

*Tipula ludoviciana* is allied to, and superficially resembles, *T. sayi* Alex. (*costalis* Say) which has the antennæ of the male short, about reaching the base of the abdomen; no dark seam along the vein *Cu;* the petiole of cell $M_1$ much shorter, and the colorational and hypopygial details different.

This new species of *Tipula* has the male antennæ of a length that is quite unique among the known nearctic species of the genus, but which is equalled or exceeded in certain exotic forms.

**Tipula plutonis,** new species.

Similar to *T. coracina* Alex. of northern Alaska; general coloration gray, the præscutal stripes darker; wings almost clear; abdomen dark gray with the lateral margins of the tergites broadly yellowish; male hypopygium very simple in structure, the ninth tergite broadly transverse, the posterior margin almost straight across with a tiny V-shaped median notch; outer pleural appendage very large and tumid, working transversely across the genital chamber; ninth sternite with a deep, V-shaped notch.

*Male.*—Length 10.5 mm.; wing 11.5 mm.

Frontal prolongation of the head dark brown, the nasus distinct; mouthparts dark brown. Antennæ short, the basal segments paler brown, the flagellum dark brown throughout; segments of the flagellum short-cylindrical with the terminal swelling about equal to the basal enlargement, the segments but feebly constricted at midlength. Head light gray, more obscure posteriorly.

Mesonotal præscutum dark gray with four indistinct dark brown stripes, the median pair very indistinctly divided by a capillary line. Remainder of the mesonotum dark gray, the scutal lobes indistinctly marked with brownish. Pleura gray, the dorso-pleural membranes more yellowish. Halteres yellowish brown, the knobs dark brown. Legs with the coxæ dark gray, tipped with paler; trochanters yellowish, tipped with blackish; remainder of the legs broken. Wings subhyaline or very pale grayish; stigma distinct, brown; a distinct obliterative streak extending from before the stigma through cell *1st* $M_2$; veins dark brown. Venation: *Rs* almost straight; cell $M_1$ very deep, the petiole short, about equal to a or a little less than *r-m;* cell *1st* $M_2$ pentagonal; *m-cu* obliterated by the punctiform contact of $Cu_1$ on $M_{3+4}$.

Abdomen dark gray, the lateral margins of the tergites broadly yellowish, the posterior margins of the tergites and sternites very narrowly and indistinctly ringed with silvery. Male hypopygium of very simple structure. Ninth tergite flattened, broadly transverse, almost rectangular, the posterior margin almost straight across and with a minute median V-shaped notch. Ninth pleurite very extensive, the suture indicated by a distinct curved line beneath, the proximal ventral angle narrowed and tufted with a few long, silky hairs. Outer pleural appendage very large and tumid, the ventral face blackened, the surface of the appendage covered with a few short appressed hairs; inner pleural appendage represented by a small flattened, subcircular lobe. The pleural appendages work across the genital chamber after the fashion of the Limnobiini, not against the ninth tergite as in most species of the genus. Ninth sternite profoundly notched by a narrow, V-shaped incision. Eighth sternite

unarmed. Eighth tergite, except at the ends, concealed beneath the seventh tergite.

*Habitat.*—California.

*Holotype.*—♂, Alta Meadow, Sequoia National Park, California, altitude 9,000 feet, July 19, 1907, (J. Chester Bradley).

The type is in the collection of Cornell University.

This primitive little *Tipula* bears a certain resemblance to *T. coracina* Alex. of Alaska, and the two probably belong to the same group of the genus. The type of *T. plutonis* was sent to Prof. Doane for comparison with his types; he notes the general resemblance of the species to *T. spernax* O. S., to which, however, the species is at most distantly related. The fused hypopygium of *T. spernax* with a broad, median tergal lobe will easily separate the species from any other similar member of the genus.

**Tipula shasta,** new species.

Belongs to the *angustipennis* group, close to *T. angustipennis* Lw., but with the thorax darker coloured, the wings of a very decided reddish yellow tinge, the abdomen without a black dorso-median stripe, and the details of the male hypopygium different.

*Male.*—Length 20–21 mm.; wing 17–18 mm.

Frontal prolongation of the head black, moderately elongated, the nasus distinct; mouth-parts black. Antennæ with the first segment black; the second segment and basal two-thirds of the first flagellar segment pale brown to almost black; remainder of the antennæ black; flagellar segments with the basal swelling moderate in size. Head broad, genæ swollen, eyes small. Head dark brown with a very narrow, pale, whitish yellow line surrounding the eyes.

Mesonotal præscutum buffy, more dusky anteriorly, clearer near the suture; præscutum with four very distinct, dark brown stripes, the median pair long, slightly narrowed behind, separated from one another by a more or less distinct capillary line; the lateral stripes, and, less distinctly, the median stripes, are surrounded by a narrow, intensely black border; scutum buffy, the lobes dark brown, surrounded by narrow, black margins; scutellum with three blackish lines; postnotum dark. Pleura dark brown, indistinctly blotched with still darker markings. Halteres orange, the knobs and terminal portions of the stem dark brown. Legs with the coxæ grayish brown; trochanters brown, femora reddish with the tips narrowly dark brown; tibiæ pale reddish, the tips narrowly and indistinctly darkened; tarsi with the basal segments dull reddish, gradually passing into a dark brown. Wings with a strong, saturated, reddish yellow tinge, clearer, more yellow, on the costal region, especially cell *Sc*, more brownish on the posterior portion and the wing-apex in cells $R_2$ and $R_3$; stigma large, dark brown; a small hyaline obliterative area before and beyond the stigma; an indistinct hyaline line across the base of cell *1st* $M_2$; a large pale blotch toward the end of cell *M*, as usual in this group of species; the only nearctic species of *Tipula* known to the writer with wings of this colour is *T. ultima* Alex. (*flavicans* Fabr.) of the eastern United States. Venation: cell $M_1$ short-petiolate, the petiole a little longer than *r-m; m-cu* distinct or punctiform.

Abdomen with the first segment blackish; remainder of the abdomen bright reddish, the lateral margins of the tergites more obscure; third abdominal tergite usually a little darker in colour than the other segments. Male hypopy-

gium very similar to that of *T. angustipennis*, but more enlarged and compressed. Ninth tergite large, gradually narrowed posteriorly, the caudal margin with a very broad and deep V-shaped notch, the apices of the adjacent lobes bluntly rounded, and each tipped with a small, chitinized tubercle. Ninth pleurite complete, large, the posterior angle produced caudad into a broad, flattened, obtuse chitinized lobe; proximal ventral angles of the pleurite each with a very prominent yellowish fleshy lobe that juts caudad, the apex bifid by a broad notch; outer pleural appendage small, cylindrical to subclavate, with numerous long, pale hairs; inner pleural appendage a large, compressed blade whose apex juts into the notch of the tergite. Ninth sternite with the adjacent margins contiguous, from the opening a long, slender, chitinized rod and a few long, coarse, yellow hairs protrude. Eighth sternite unarmed, somewhat projecting behind. Eighth tergite entirely concealed beneath the seventh tergite.

*Habitat.*—California.

*Holotype.*—♂, Foothills of Mount Shasta, California, May 17, 1914.

*Paratopotypes.*—Males with the type, May 16, 17; *paratypes* two ♂'s, Yosemite Valley, California, May 22, 1908, (E. T. Cresson, Jr.).

The type is in the collection of Dr. Dietz; paratypes in the collection of the writer and the American Entomological Society.

This beautiful, yellow-winged *Tipula* is related to *T. angustipennis* Lw. of northern North America, but is abundantly distinct. The type material was very kindly sent me by Dr. Dietz with the indication that it probably represented a new species. The writer could not reconcile the fly with any of the descriptions, and sent the material to Prof. Doane for his opinion and comparison with his extensive series of Western Tipulas. He also believes the species to be close to *T. angustipennis*, which is certainly the case, but the two species show numerous constant differences. Prof. Doane writes that he has a female of this species from the Yosemite Valley.

## NOTES ON PELENOMUS SULCICOLLIS FÄHRS. (CURCULIONIDÆ).

BY ROBERT MATHESON, ITHACA, N.Y.

During the past three seasons a small patch of some five or six square yards of fringed loosestrife (*Steironema ciliatum* (L.) Raf.) growing on the bank of a small stream which passes near my house has been badly destroyed by some foliage feeding insect. My attention was attracted to it this season as nearly every plant, and it was almost a pure stand of this species, was practically destroyed, the leaves having been completely riddled, and many of the stalks badly eaten. Previous examinations had shown that a small coleopterous larva was doing the work, but I had not noted them in any considerable numbers. Late in July (1918) I found numerous small silken cocoons scattered over the under side of the leaves of the loosestrife, and on later examination I found many small snout beetles feeding on the plants.

As the beetle seemed to be a species about which very little was known, I reared a few of the larvæ and made a close examination for the place of egg deposition. My efforts were rewarded and, though rather late in the season, I found all stages of the beetle. The beetle was kindly identified by Mr. C. W.

Leng as *Pelenomus sulcicollis* Fährs. (Curculionidæ), and as nothing has ever been published on the biology of this genus I think these few notes may be of interest.

The beetles were very abundant during August and early September, oftentimes five or six beetles being present on a single leaf. They feed largely on the leaf tissue, skeletonizing it; though this year, on account of the almost complete destruction of the leaves by the larvæ, the beetles were forced to feed on the stems and mid-ribs of the leaves. These they cut into with their mandibles, and then eat the softer parts within. During the latter part of September the beetles became fewer and fewer in numbers, and there is no doubt that they hibernate somewhere amongst the fallen leaves and rubbish.

After some search I found where the eggs are laid. Just beneath the lower epidermis of the leaves near the veins I found a few empty egg-shells. (Plate XVIII, Fig. 3). The eggs are laid singly and, as a result of the oviposition, the area in which the egg is laid dies and becomes brown. This dead area shows only on the lower surface, evidently the parenchyma not being sufficiently damaged.

The larvæ feed on the lower surface of the leaves almost entirely. They destroy the lower epidermis and parenchyma, leaving the upper epidermis intact. This soon dies, and large open spaces are left, giving the appearance shown in Plate XVIII, Figs. 1 and 2. As the larvæ do not possess legs they evidently move by the action of the large flat surfaces on the ventral side of each segment. These can evidently be moved slightly by muscular action, though I have never seen the larvæ actually crawl.

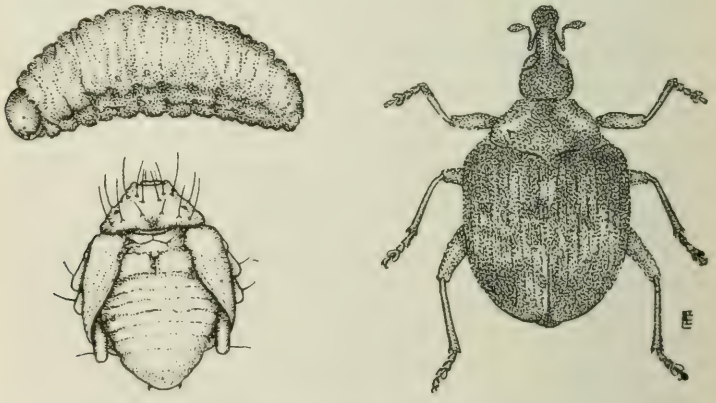

Fig 23.—*Pelenomus sulcicollis* Fährs.; mature larva, pupa and adult.

When mature the larvæ spin small silken cocoons on the under surface or axil of the leaf, and in the destroyed ends of the stem. These pupal cases are rather beautiful, especially when a number of them are formed close together. (Plate XVIII, Fig. 5.) In these silken cells the larvæ transform to pupæ within a few days, and the adults emerge in about two weeks. After emergence the beetles feed quite extensively before going into hibernation. So far as my observations go there is undoubtedly only a single generation a season.

*Pelenomus sulcicollis* Fährs.—1. Destruction of foliage. 2. Destruction of plant. 3. Eggs in leaf tissue. 4. View of destroyed plants. 5. Pupal cases on stem and leaves.

DESCRIPTION OF STAGES.

*The egg.*—The egg was not observed though egg-shells were found in the place of oviposition.

*The larva.* — The mature larva is dirty white to almost pure white in colour. The head is rather strongly chitinized, and the prothorax possesses a narrow, chitinized area on the dorsal surface. The rest of the larva is soft and possesses no defensive structures, even setæ of all kinds being absent. The head is small, rounded, almost spherical in shape, and about one-half as wide as the thorax. Two black ocelli are present on each side of the head just above the mandibles. The body of the mature larvæ is strongly curved dorsally, much wrinkled by transverse depressions, and tapers slightly in both directions. The ventral surface is flattened. Legs are absent. The larva measures 4 mm. in length.

*The pupa.* — The pupa is broad, short and somewhat flattened. It is at first pure white, later darkening, and before transforming assumes the dark colours of the beetles. The wing-pads lie curved under the body, passing between the second and third pair of legs. The prothorax is strongly tuberculate, and from the tubercules arise long, chitinized setæ, about 14 in all. Similar setæ arise from the distal lateral ends of the femora, the head and beak. These long setæ prevent the soft body of the pupa from coming in contact with the pupal cell. The pupa measures 2.5 mm. in length by 2 mm. in extreme breadth.

*The beetle.* — The beetle is a rather pretty snout beetle, and is described by Blatchley and Leng in their "Rhyncophora of North-eastern America" as follows:—"Broadly oval. Dark piceous, clothed with brown scales having a brassy tinge and variegated with pale ones, the latter condensed on the sides and on basal half of dorsal channel of thorax, and forming on the elytra a small post-scutellar and numerous smaller subquadrate spots; antennæ and legs reddish-brown. Beak scarcely longer than head, widened toward apex, densely and finely punctate. Thorax nearly twice as wide at base as long, dorsal channel entire, widening into a fovea in front; lateral tubercles acute, disc finely and closely punctured. Elytra one-fourth wider at base than thorax, sides broadly rounded, striæ punctured; intervals feebly convex, the alternate ones slightly more so. Length 2.3–2.5 mm."

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## THE SYNONYMY OF HELICE CHAMBERS AND THEISOA CHAMBERS. (MICROLEPIDOPTERA).

BY ANNETTE F. BRAUN, CINCINNATI, O.

The description of the venation of *Theisoa* by Chambers in his characterization of that genus, and his figure in the Journal of the Cincinnati Society of Natural History were both made from male specimens, as an examination of material of both sexes shows. Singularly enough, subsequent studies on this genus have also been confined to males, as must be concluded from the published notes by Mr. Busck (cf. Proc. Ent. Soc. Wash., XI, 94, 1909), where, in establishing the synonymy of *Cacelice* and *Theisoa*, he refers to the figure of the "characteristic venation" of this genus, as shown in *Cacelice permolestella* Busck. Observations made by the writer on *Theisoa constrictella*, *T. permolestella* and *Helice pallidochrella*, and presented below reopen the interesting question of

the relationship of *Theisoa* and *Helice*. For earlier references to these genera see Dyar's List, Nos. 5592, 6130, 6182.

In *Theisoa constrictella*, males (Fig. 24–a) in the fore wing, veins 7 and 9 are out of 6, with 8 absent; here the transverse vein is much nearer to 10 than to 9. In the female (Fig. 24–b)8 is present, and 9 separates from the stalk of 6, 7, 8 and 9 sooner than in the male, thus showing a less specialized condition. In the hind wing of the male (Fig. 24-c) the vein apparently forming the upper margin of the cell reaches the margin of the wing just *below* the apex; if followed toward base, it is seen to curve downward, being more or less distinctly connected with lower margin of cell near the middle of the wing by a very short discal vein, from thence to base it is obsolescent. In one specimen, the hind wing on one side (Fig. 24–d) shows an additional vein lying costalward of this; it is indistinct from base to middle, where it makes a scarcely noticeable bend toward the discal vein, and reaches the costa at about two-thirds the wing length. I consider this vein 7 and its presence in this instance an atavistic character. In the hind wing of the female (Fig. 24–e) the upper margin of the cell extends almost straight from base, reaching the *costa* almost at apex; it is rather indistinct in its basal half. Its course in the basal half is exactly that of the "additional vein" in one male wing, above mentioned; in its apical half its course is such as to lead to the inference that it is formed by the coalescence of the vein, which normally in the male forms the upper margin of the cell with the "additional vein." There is no indication of a discal vein in the female. From these observations I conclude that the venation of the hind wing in this species was derived from a type in which both veins, 6 and 7, were present and separate; in the process of evolution, the male and female show a divergence, in direction of development to the extent that in the male vein 7 has disappeared completely by obsolescence leaving vein 6 to form the upper margin of the cell, while in the female, 6 has coalesced completely with 7, the only evidence of the process remaining being the costal ending of the apical vein as contrasted with its terminal ending in the male.

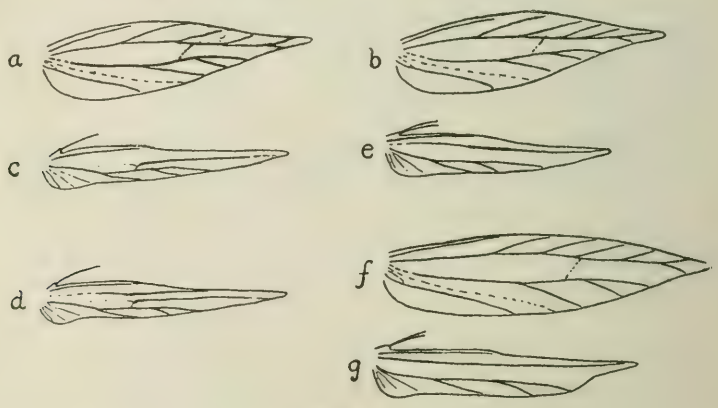


Fig. 24.

In order to determine whether the same difference in venation exists between the sexes of *Theisoa permolestella*, an examination of a series of specimen. was made; this examination revealed that all the specimens of *T. permolestella*

are males. The venation agrees with the usual venation of the male *T. constrictella*. No indication of vein 7 was found in the hind wing; vein 6 reaches the margin considerably below the apex.

*Helice pallidochrella* is found to be represented by females only. The venation agrees with that of the female *Theisoa constrictella;* with slight differences indicating a more generalized condition, *viz.*, in the forewing (Fig.24–f) 9 is separate from the stalk of 6, 7 and 8; in the hind wing (Fig. 24–g) 6+7 is distinct to the base, but its course is exactly that of this vein in *T. constrictella* female.

My conclusion is that *Theisoa permolestella* is the male of *Helice pallidochrella*. In the genus *Helice* we have an extremely specialized Gelechiid genus, of which the female of one species, in venation the least specialized, has alone retained the characteristic Gelechiid shape of the hind wing. Another factor which argues against the retention of the genus *Theisoa* as a Cosmopterygid genus, is that the costa of the hind wing does not show a degree of modification in outline corresponding to the specialization in venation.

The supposed specific differences separating *Theisoa permolestella* from *Helice pallidochrella*, are not confined to either, but are shown in individuals of both. Late summer specimens of males (supposed *T. permolestella*) and females (*H. pallidochrella*) show a dark tornal spot opposite the costal spot at the apical third, which is more or less distinct, sometimes as large as the costal spot.

The synonymy of the genera and species under discussion will, therefore, stand as follows:

**Helice** Chambers, Can. Ent., V, 187, 1873 (Type *H. pallidochrella* Chambers).
syn. *Theisoa* Chambers; *Cacelice* Busck.

1. *pallidochrella* Chambers.
   syn. *gleditschiæella* Chambers; *permolestella* (Busck).
2. *constrictella* (Zeller).
   syn. *bifasciella* (Chambers).
3. *multifasciella* (Chambers).

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## NOTES ON SULCACIS LENGI DURY* AND ORCHESIA CASTANEA MELS.,* BREEDING IN FUNGI.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

### **Sulcacis lengi** Dury.

This species, which was described by Dury in 1917 (Syn. of Col., Fam. Cisidæ (Cioidæ) of Amer. N. of Mex.-Jour. Cin. Soc. Nat. His., Vol. XXII, No. 2, p. 20) from Vermont and Cincinnati specimens, has recently been found in New Jersey breeding in the following fungi,**—*Lenzites betulina* L., *Polyporus versicolor* L., *Polyporus gilvus* Sch., and *Polyporus hirsutus* Wul., all of which occur on dead wood of deciduous trees. It was most abundant in *Polyporus versicolor* at Monmouth Junction, N.J., and occurred only sparingly in *Polyporus hirsutus*.

Hibernation appears to take place in both larval and adult stages, as both of these forms were found on March 1, but no pupæ. By keeping the infested

*Kindly identified by C. W. Leng.
**Identified by Erdman West.

fungi in a warm room for several weeks, pupæ were finally secured. Most of the larval feeding was done in the context, and it was here also that pupation took place.

*Full-grown Larva.*—Length 1.7 mm.; width 0.42 mm. Grub-like; slightly curved when viewed laterally; subcylindrical, tapering slightly anteriorly; skin somewhat wrinkled, creamy white except for mandibles and adjacent mouth-parts which are dark; ocelli lateral, one pair and a single one above; body segmentation distinct; body bearing a few scattered hairs; first thoracic segment twice as long as second; remaining thoracic and abdominal segments subequal in length; ninth and last abdominal segment bears a dorsal pair of dark, strongly chitinized, comparatively large hooks curved anteriorly; each leg terminated by a fine curved hook.

*Pupa.*—Length 1.22 mm.; width 0.48 mm. Creamy white, sparsely hairy, posterior end terminated by two parallel spines.

**Orchesia castanea** Mels.

This species was described by Melsheimer in 1846 (Proc. Phil. Acad. Nat. Sci., III, 57). Blatchley (Coleoptera of Indiana) records it from Indiana in woody fungi and Smith (N. J. State Mus. Rept. 1909) lists it from several points in New Jersey from "hard fungi" on trees.

During the first week of March, larvæ of this species were plentiful in *Trametes suaveolens* L., on willow at Kingston, N.J., and to a slight extent in *Lenzites betulina* at New Brunswick, N.J. In view of this it appears that overwintering takes place in the larval stage. It undoubtedly breeds in other species of fungi as *Trametes suaveolens* and *Lenzites betulina* are not what one would call hard fungi, and as Schwarz (Psyche I, 1876, pp. 145–148) mentions it as inhabitating a fungus growing on a dead beech. The larva feeds in the context and tubes, and pupation, which requires about eight days in April, occurs in the context.

*Full-grown Larva.*—Length 7 mm.; width 1.6 mm.; subcylindrical, slightly curved when viewed laterally; sparsely hairy; segmentation distinct; creamy white except for head and mouth-parts, which are brownish; antenna conical, light, three-jointed, distal segment bearing two hairs on tip; ocelli lateral, five in number, three in a row and two single ones posterior to them; first thoracic segment one and one-half times length of third; second thoracic segment somewhat constricted medially; nine abdominal segments; ventral abdominal surface wrinkled; legs three-jointed, each terminated by a dark, chitinized hook; each leg bears a few spine-like hairs and a group of short spines on anterior basal portion; spiracles on first prothoracic and abdominal segments one to eight.

*Pupa.*—Length 5–6.5 mm.; width 1.8–2.3 mm.; elongate, rounded anteriorly and pointed posteriorly; creamy white; head and prothorax bearing numerous large and small acuminate spines each with a tuberculate base, each spine bearing a long hair which arises just below the tip, the largest spines occurring near lateral and anterior margins of prothorax; a pair of similar spines occur on dorsal surface of second and third thoracic segments; each abdominal segment bears a transverse row of dorsal spines, the largest ones being median and lateral; abdominal spines slant posteriorly; last abdominal segment bears a pair of small hooks curved upward and anteriorly.

# THE PANURGINE BEES OF NORTH DAKOTA AND A NEW EPEOLUS. (HYM.)

BY O. A. STEVENS, AGRICULTURAL COLLEGE, N. DAK.

Since 1910 the writer has spent as much time as other duties would permit collecting and studying the flower-visiting insects, chiefly bees, of this state. A list of the wasps had been published (Ent. News, Vol. 28, pp. 419–423, 1917) Records of some of the bees have been published as follows:

Cockerell—Can. Ent. Vol. 43, p. 390, 1911.—*Neopasites* (*Holcopasites*) *robertsoni* Cwfd. and *Andrena hirticincta* Prov.

Crawford—Can. Ent., Vol. 45, pp. 155–156, 1913.—*Prosopis stevensi*, n. sp.
—Proc. U. S. Mus., Vol. 48, p. 579, 1915.—species of *Panurginus*.
—Insec. Ins. Menst., Vol. 3, pp. 125–126, 1915.—*Holcopasites stevensi*, n. sp.

Franklin —Ent. News, Vol. 26, pp. 413–415, 1915.—species of *Bombidæ*.

Swenk —Univ. Nebr. Studies, Vol. 12, No. 1, 1912.—species of *Nomada* (3 new).
—Ibid., Vol. 15, No. 2, 1915.—species of *Nomadidæ* (8 new) and *Stelididæ*.

The present paper presents records of the *Panurgidæ* of Ashmead, and also a new *Epeolus*. Prof. Cockerell has kindly suggested that these described species were new and has looked over the descriptions. The types will be placed in the U. S. National Museum.

Family MACROPIDÆ.

**Macropis morsei** Robertson. (det. Crawford).

Fargo, Kensal, New Rockford, Deering, Kenmare, Pleasant Lake and Granville. Mostly at flowers of *Steironema;* at one time many of both sexes were found sucking nectar at *Lactuca pulchella* (which was growing near a quantity of *Steironema*). Occasional specimens at *Apocynum androsæmifolium* and *A. hypericifolium* (males), *Petalostemon oligophyllum*, *Onagra strigosa*, *Solidago canadensis*, *Symphoricarpos occidentalis* and *Taraxacum taraxacum;* June 26 to Aug. 11.

Family DUFOUREIDÆ.

**Halictoides marginatus** (Cresson). (det. Crawford).

Fargo, Valley City, Lakota, Rugby, Monango (J. F. Brenckle). Mott (J. R. Campbell), Dickinson (C. H. Waldron). A rather common bee, mostly at sunflowers (*Helianthus petiolaris*, *H. scaberrimus* and *H. tuberosus*), also at *Grindelia squarrosa;* Aug. 9 to Sept. 18.

**Halictoides maurus** (Cresson). (det. Crawford).

Cavalier, Valley City, Mandan, Glen Ullin, Leeds, Minot, Marmarth. A fairly common bee at flowers of *Campanula rotundifolia;* June 30 to Aug. 5.

Family PANURGIDÆ.

**Perdita canadensis** Crawford (det. Crawford).

Sheldon, Pleasant Lake, Williston and Dickinson (C. H. Waldron). At flowers of *Helianthus petiolaris* and *H. scaberrimus;* July 25 to Aug. 21. Some twenty of each sex and several pairs taken in copula. The male has not been described. The more strongly marked ones agree quite closely with the description of that sex of *P. lacteipennis* Swenk and Cockerell. In others the yellow markings are almost entirely absent. The mandibles are usually yellowish-

red medially, darker red apically and greenish black basally. The females agree well with the original description. The spots on the first abdominal segment are often absent, and the bands on the others are sometimes all interrupted medilly. Mr. Crawford writes that he is uncertain of the validity of the species.

**Perdita bruneri** Cockerell.

Fargo, Enderlin, Sheldon, Valley City, Jamestown, Bismarck, Pleasant Lake, Rugby, Minot, Schafer, Williston and Dickinson (C. H. Waldron); Aug. 6 to Sept. 15. A common bee and much the most common of the genus in the State. Only four females were taken at Fargo previous to 1917, when it was found in considerable numbers. Mostly at flowers of *Grindelia squarrosa;* also at *Chrysopsis villosa*, *Aster multiflorus* and *Helianthus petiolaris.*

**Perdita swenki** Crawford.

Valley City and Pleasant Lake at *Grindelia squarrosa, Chrysopsis villosa, Helianthus maximiliani* and *Solidago canadensis;* Aug. 11 and 13. Taken only the two times, although in considerable numbers at Valley City. These two species determined by Prof. Cockerell some time ago as *P. cockerelli* Cwfd. and *P. bruneri* Ckll.

**Perdita tridentata,** new species. (Fig. 25, 1).

Male.—Length 4 to 5.5 mm. Head and thorax greenish-blue. Yellow markings as follows: base of clypeus with a broad median and narrow marginal extensions, supra-clypeal spot about half as high as wide, lateral face marks gradually or irregularly narrowed to a point at about the upper level of antennal sockets (see Fig. 1), mandibles except tips, scape and under side of flagellum (less so on first three joints); tegulæ, wingbases and small spots on pronotum; front half of anterior legs for their entire length, a narrower stripe on intermediate ones, knees of posterior legs and often a very narrow stripe on their tibiæ; bands on first, fourth and fifth segments interrupted medially, those on second and third slightly notched.

Apex of clypeus, labrum, upper side of flagellum and a small spot on apex of scape, light brown; legs and abdomen dark brown; wings clear but nervures dark, apex of abdomen triangular but obtusely rounded.

Type No. 6372. The type is from a series of 13 specimens taken on *Helianthus petiolaris* at Pleasant Lake, North Dakota, Aug. 11, 1913. Two were taken on *H. scaberrimus* near Sheldon, Aug. 14, 1916, and one on *H. petiolaris* at the same place Aug. 21, 1918.

"A species of the *affinis* group," writes Prof. Cockerell. The abdomen is very much like that of *P. swenki* Cwfd. The clypeal marking is somewhat variable, the central extension sometimes quadrate and covering a large part of the clypeus, but more commonly rounded and shorter, the lateral extension sometimes nearly absent. In one specimen the clypeus is nearly all dark and the abdominal bands are considerably reduced. Supra-clypeal mark often notched above, sometimes almost divided.

**Perdita laticincta** Swenk and Cockerell.

Sheldon, Pleasant Lake and Dickinson (C. H. Waldron). All at *Helianthus petiolaris;* July 28 to Aug. 21. Prof. Cockerell has confirmed the identification of this and the next two species.

**Perdita citrinella** Graenicher.

Minot and Granville. At *Petalostemon oligophyllum;* July 8 and Aug. 22, five females, eleven males.

Female.—Dark sutures of head and thorax quite prominent; two specimens have tibiæ dark except knees, middle tarsi dark, ventral surface of abdomen dark medially, and scape and upper side of flagellum dark.

Male.—Closely resembles the female. Hind tibiæ usually dark behind; abdomen usually with dark triangular patches at sides of segments 2 to 5.

The males does not seem to have been previously described, although Crawford recorded* a specimen from Medicine Hat, Alberta, Canada. The markings of both sexes vary quite a little, but there is no suggestion of intergrading with the following species. In a series of eight males taken at the same time, considerable variation is known. The dark lines next the eyes are shorter than in the female, but the spots between these and the antennæ are prominent, sometimes each occupying one-fourth the width of the front; well developed spots are sometimes present at sides of lateral ocelli and small ones behind apex of eyes. Two have lateral brown lines on the mesoscutum, while one has suffused brown lines both medially and laterally, and nearly complete bands on abdomen. One has hind tarsi yellow.

**Perdita perpallida** Cockerell.

Sand hills near Sheldon, Aug. 12, 1916, and Aug. 21, 1918, at *Petalostemon villosum;* ten females, seven males. This species would seem to have been expected where the preceding was taken, and vice versa. This plant occurs only in this part of the State and near Pleasant Lake and Towner (not far from where *Perdita citrinella* was taken); *P. oligophyllum* and *purpureum* are common plants throughout the State.

**Perdita martini** Cockerell.

1895.—*Perdita martini* Cockerell, Proc. Acad. Nat. Sci. Phila., 1895, p. 14, male.

Male.—Agrees closely with the original description. The yellow on the face extends about to the middle of the anterior ocellus, its upper line irregular, being depressed under the lateral ocelli and slightly produced next the eye, a narrow line following the direction of its upper border reaching the lateral ocellus. Brown of the antennæ above mostly limited to the junctions of the first four or five joints of the flagellum; yellow on cheeks extending fully two-thirds the length of the eyes.

Meso-pleuræ with a broad yellow mark extending from front coxæ to midway between middle coxæ and tubercles; middle tibiæ with a dark spot above, posterior tibiæ dark, and femora on apical half both above and below; posterior tarsi brownish; stigma yellow, nervures brownish.

Female.—Length 5 mm. Yellow on clypeus, labrum, a low supra-clypeal spot, spot behind base of mandibles, lateral face marks extending from middle of clypeus to slightly above base of antennæ with an irregular margin, scape of antennæ and lower side of flagellum, tegulæ, tubercles and a line on prothorax connecting them. Legs with coxæ dark, trochanters yellow; anterior yellow except a spot in inner side of femora; middle with a larger spot on femora, and a small one on outer side of tibiæ; posterior dark except knees. Dark bands of

*Can. Ent. vol. 44, p. 359, 1912.

abdomen rather more pronounced than in male, the first three slightly produced backward at the sides.

Minot, North Dakota, Aug. 22, 1915. One of each sex on *Grindelia squarrosa*. Allotype No. 9293; male No. 9294. The female runs in Cockerell's table (1896) to *zonalis* Cress. or *rectangulata* Ckll. It resembles the latter in face markings. Mr. E. T. Cresson, Jr., has kindly compared these with the type of *P. martini* and considers them identical. He notes: "yellow of cheeks to ½ eye and black of occiput extends nearly to lower orbit level; mid-tibiæ not darkened, post-tibiæ darkened above, all femora immaculate; nervures pale and all pale parts more whitish than yellow." He also sends a sketch of the pleural markings, which shows a rather greater and more irregular extension of yellow on the fore part of the mesopleuræ.

**Greeyleyella beardsleyi** Cockerell. (det. Crawford).

1907.—*Panurginus malvastri* Swenk and Cockerell, Ent. News, Vol. 16, p. 179.

Dickinson, two females July 4, 1912 (C. H. Waldron), two females and a male July 4, 1914; Gascoyne, June 19, 1918, one pair in copula, five males and three females; Mott, July 7, one male. All at flowers of *Malvastrum coccineum*.

To the list of species *Panurginus* which Crawford has published *, a number of new localities may be added and the complete list is given, herewith. *P. innuptus*, *nebrascensis* and *renimaculatus* are quite common bees, the others less so.

**Panurginus innuptus** Cockerell.

Fargo, Nicholson, Valley City, Bismarck, Dickinson (C. H. Waldron), Marmarth, Lakota, Stanley and Minot. At flowers of *Helianthus annuus* (cult.), *H. maximiliani*, *H. tuberosus* and *H. strumosus*, *Brauneria pallida*, *Ratibida columnaris*, *Solidago canadensis*, *Grindelia squarrosa*, and *Centaurea jacea* (cult.); July 4 to Sept. 11.

**Panurginus renimaculatus** Cockerell.

Fargo, Jamestown, McKenzie, Bismarck, Dickinson (C. H. Waldron), Sentinel Butte, Grand Forks, Lakota, Crary, Perth, Devils Lake, Minot and Williston. Mostly at flowers of *Grindelia squarrosa*, occasionally at *Aster multiflorus*, *A. paniculatus*, *A. chinensis* (cult.), *Boltonia asteroides*, *Helianthus maximiliani* and *H. petiolaris;* Aug. 5 to Sept. 22.

In addition to the characters given by Crawford for the male, the wings are clear, and the dorsal surface of the first abdominal segment closely punctured up to the depressed apex (*nebrascensis* has smoky wings and first segment with more or less of a smooth shining space before the depressed apex, and a smooth, slightly raised median line.)

**Panurginus nebrascensis** Crawford.

Fargo, Valley City, Jamestown, McKenzie, Bismarck, Lakota, Crary, Devil's Lake, Granville, Minot, Tolley, Williston. Mostly at flowers of *Grindelia squarrosa*, also at *Chrysopsis villosa*, *Cuscuta gronovii* (1 male), *Petalosteon oligophyllum*, *Solidago canadensis* and *Taraxacum taraxacum;* Aug. 5 to Sept. 28.

**Panurginus simulans** Swenk and Cockerell.

Fargo, Williston and Dickinson (C. H. Waldron). At flowers of *Helianthus annuus* (cult.), *H. maximiliani*, *H. petiolaris* and *Taraxacum taraxacum;* July 28

*Proc. U. S. Mus., vol. 48, p. 579, 1915.

to Sept. 8. I have never been quite satisfied with the disposition of this species, but Mr. Crawford writes that he has twice compared it with the types.

**Panurginus piercei** Crawford.

Fargo, Valley City, Dickinson (C. H. Waldron), Monango (J. F. Brenckle), Mott (J. R. Campbell), Wales, Lakota, Crary and Perth. At flowers of *Grindelia squarrosa*, *Helianthus annuus* (cult.), *H. maximiliani*, *H. scaberrimus*, *H. tuberosus* and *Solidago rigida;* Aug. 8 to Sept. 16.

Two other species of *Panurginus* have been collected but not yet determined. One is a species related to *P. parvus* Rob. flying in July; the other is autumnal and probably related to some of the eastern forms.

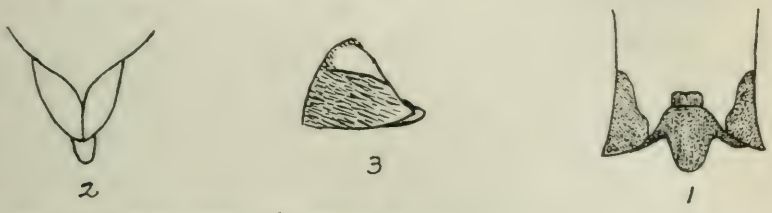


Fig. 25.—1. *Perdita tridentata*—face markings of type.
2 and 3. *Hesperapis carinata*—dorsal (fig. 2) and laterol (fig. 3) view of seventh and eighth abdominal segment.

**Hesperapis carinata,** new species.

Male.—Length 10–11 mm. Black with dense ochraceous pubescence, which is paler on the face and pleuræ, also on the thorax above in some specimens; face narrowed below, about as long as the median width; vertex smooth and shining, produced but very little beyond the eyes; antennæ not elongate, black; the flagellum reddish beneath, its joints scarcely longer than wide except the first and last which are slightly so, the second half as long; maxillary palpi about 750 microns, the six joints subequal; joints of the labial palpi about 425, 425, 275 and 275 microns; mandibles toothed.

Mesoscutum rather dull, the punctures of moderate size and separated by slightly more than a puncture width; propodeum rounded, the central area very smooth and shining, the sides dull and hairy; tegulæ reddish yellow; wings hyaline, nervures and stigma honey colour, the subcosta darker; first submarginal one-half longer than second, the second narrowed a little more than half; cubital nervure very straight throughout, also the second transverse-cubital, and the basal nearly so; the basal received a little anterior of the transverse medial; legs not thickened, dark, tarsi reddish yellow, the claws deeply cleft.

Abdomen dull, first segment more shining and with a thin ochraceous pubescence; the others with short black hairs and a few scattered ochraceous ones especially on the second and third; all with prominent apical ochraceous bands; seventh dorsal segment punctured at the base and with ochraceous pubescence at base and on the sides, testaceous, smooth and shining with a high, Y-shaped carina; eighth ventral somewhat narrowed and rounded at apex. (Fig. 25—2, 3).

Ten males, at flowers of *Helianthus scaberrimus* in the sand hills near Sheldon, North Dakota; August 12, 1916. Type No. 9681. Also six males at *H. petiolaris*, same place August 21, 1918. This runs in Cockerell's table (Psyche, 1916, p. 176) to *larreæ*, but Prof. Cockerell writes that the superficial resemblance is

rather to *rhodocerata*—"has quite the appearance of some *Hesperapis*, but is a peculiar and isolated species." The finding of a species of this genus previously known only from the southwestern United States, presents another interesting question in the status of this group. The first lot were taken early in the forenoon on a misty day and were inactive. The second trip proved too much the same to shed any further light on their habits.

**Calliopsis coloradensis** (Cresson).

Fargo, Valley City, Jamestown, Bismarck, Sentinel Butte, Lakota, Crary, Devils Lake, Perth, Granville, Minot and Williston. A common bee, usually at flowers of *Grindelia squarrosa*, also at *Chrysopsis villosa;* Aug. 4 to Sept. 10. Specimens of this species have been examined by both Cockerell and Crawford.

**Calliopsis nebrascensis** Crawford. (det. Crawford).

Valley City, July 26, 1913. A number at flowers of *Verbena hastata.*

*Calliopsis andreniformis* Smith. (det. Cockerell).

Fargo, Aug. 24 and 26, 1912. One female and two males at flowers of *Melilotus alba.* Another female on *Solidago canadensis*, Fargo, Sept. 11, 1917, is referred by Cockerell to var. *rhodophilus* Ckll.

**Protandrena asclepiadis** Cockerell. (det. Crawford).

Minot, Aug. 22, 1915, 2 females; Marmarth, July 4, 1918, eight females, ten males. At flowers of *Lactuca pulchella*, *Petalostemon oligophyllum*, *Symphoricarpos occidentalis* and *Astragalus gracilis* (males, about sunset).

**Epeolus dacotensis,** new species.

Female.—Length 12–14 mm., stout, black with four white abdominal bands which are broad, entire and nearly straight; sparse white appressed pubescence on margins of mesoscutum especially anteriorly, on collar, metanotum, tubercles and a small patch behind them, a few on base of abdomen and sides of fifth segment; otherwise entirely black; a few erect, black hairs on upper part of face, vertex, cheeks, pleuræ and mesoscutum.

Clypeus with close, shallow punctures and scattered larger ones; face slightly narrowed below; maxillary palpi with only one evident free joint which is about .3 mm. long; central lobes of mesoscutum large, low and rounded, the lateral ones small, indistinctly pointed; mesonotum coarsely and somewhat confluently punctured; wings dark, the second submarginal narrowed nearly to a point, third not narrowed; abdomen broad, band on first segment broader than the rest, concase medially (from the base of the abdomen); last two bands slightly curved at the sides; fifth segment with a large differentiated area which is scarcely at all flattened.

Male.—Entirely similar, length 12–13 mm.; apex of abdomen truncate.

Williston, North Dakota; one female (type No. 8969) Aug. 8, four males Aug. 14, 1915; one of the males on flowers of *Helianthus petiolaris*, the other, at a clay bank; Marmarth, North Dakota, July 4, 1918, two females on *Lactuca pulchel a* and one on *Helianthus petiolaris.* A very distinct and striking species probably parasitic on *Anthophora occidentalis* and *A. neomexicana*, colonies of the former nesting at Williston, the latter at Marmarth. One of the Marmarth females has the pale pubescence more abundant on the mesonotum, and extending considerably on the mesopleuræ and a little on the outer sides of the legs, especially the tibiæ.

## ON THE USE OF THE NAMES LACHNUS AND LACHNIELLA. (HOM.)

BY A. C. BAKER, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

In aphid literature much confusion has existed in the use of the two names mentioned in the title of this note, and it seems worth while to give the history of the names at the present time in order that entomologists may have the facts before them.

The genus *Lachnus* was erected in 1835 by eurmeister, and five rather diverse species were included in the genus, but no type was set. Of these species *fagi* L. and *quercus* L. were removed as the types of other and more recent genera. Various species were from time to time set as the type of *Lachnus*. These are as follows:

1840. *Aphis roboris* Lin. by Westwood.
1863. *Lachnus pinicola* Kalt by Passerini.
1908. *Aphis nudus* De Geer by Mordwilko.
1910. *Lachnus punctatus* Burm. by Wilson.
1911. *Lachnus fasciatus* Burm. by Wilson.

Now the first three fixations are invalid, since the species were not included in the original genus. The first valid fixation, therefore, is that of Wilson 1910, when he set *punctatus* as type. According to the rules of nomenclature, this species must remain the type of the genus *Lachnus*.

Unfortunately there is no uniformity of opinion as to what *punctatus* really is. In other words, the genus *Lachnus* must remain unknown until *punctatus* is definitely determined. In 1911 Wilson wrote as follows: "A careful study of *Lachnus viminalis* Boyer, Boyer's description of that species and Burmeister's description may (?) show that *L. viminalis* Boyer is identical with *L. punctatus* Burm. In that case *Lachnus* will be definitely established with *L. fasciatus* as type." According to the present writer's reasoning it would be definitely established with *L. punctatus* (=*viminalis*) as type, the species set by Wilson in 1910. Later in his 1911 paper Wilson assumed that the two species *punctatus* and *viminalis* were the same and, following his argument as just quoted, he made *L. fasciatus* the type of *Lachnus*, disregarding his earlier fixation. This was evidently done because *L. viminalis* had been fixed as the type of *Tuberolachnus* by Mordwilko in 1908. In a recent paper (1919) Wilson makes the simple statement that *fasciatus* is the type of *Lachnus*.

The writer contends that if the identity of *punctatus* and *viminalis* is conceded to be established, then according to our rules *Tuberolachnus* will become a synonym of *Lachnus* having the same species *punctatus* (=*viminalis*) as type. And this is a species very different from *fasciatus*.

The writer holds no brief for either species, but contends that without special action suspending the rules in this case it is impossible to consider *fasciatus* the type of Lachnus. He is as anxious as any other worker to have the genus *Lachnus* definitely established, but he feels that if a change of type for the genus is desirable, considering all the facts, it can be had only through action by the authorities properly qualified to suspend the rules.

The genus *Lachniella* was erected by Del Guercio in 1909, but no type was set for the genus. In 1911 Wilson stated this fact, and then placed the genus as a synonym of *Lachnus* in the following way:

7. *Lachnus* Burmeister.

Syn. *Lachniella* Del Guercio.

Type *L. fasciatus* Burm.

Since no type had previously been established for *Lachniella*, and since the genus contained a number of diverse species the placing of it thus, according to the writer's reasoning, indicates *fasciatus*, one of the included species of *Lachniella* as its type. Otherwise there would be no reason for so placing the genus. In his most recent paper (1919) Wilson has used *Lachniella* in quite a different sense, and would exclude *fasciatus* from the genus. This species, the present writer contends, is the only one that has in any way been suggested as type of *Lachniella*, and he believes that it is the type of the genus. Otherwise the genus is without a type.

This leaves the genus *Lachniella* of Wilson without a name, and to this genus we give the name *Wilsonia* and fix *Lachniella gracilis* Wilson as its type. The different genera with designated types will thus stand as follows, at least until some definite ruling has been made changing the present ligitimate type of *Lachnus*.

Genus *Lachnus* Burm.—Type *Lachnus punctatus* Burm.

Genus *Lachniella* Del Guercio—Type *Lachnus fasciatus* Burm.

Genus *Wilsonia* Baker—Type *Lachniella gracilis* Wilson.

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## NEW COLEOPTERA. VIII.

BY H. C. FALL, TYNGSBORO, MASS.

The receipt of a very distinct new species of Ochthebius from California which it is desirable to make known, affords the opportunity for recording one or two errors in the literature of this genus. Descriptions of a few other new species are added. All types are in the author's collection.

**Ochthebius martini,** sp. nov.

Form very broad, aeneo-piceous, side margins of elytra explanate throughout and paler in colour. Labrum deeply triangularly emarginate. Prothorax one-third wider than long, widest at anterior third, sides arcuate in basal half, then suddenly deeply sinuate, nearly as in *rectus* (See Horn's figure), transparent border extending from apex to base, becoming very narrow in front of the middle, the sides strongly obliquely convergent from the point of maximum width, feebly arcuate to nearly straight basally; median line deep and entire; discal foveæ rather small and not very conspicuous, well separated, the posterior narrow and about twice the length of the anterior; lateral impressions deep and subparallel sided; surface rather densely, coarsely, evenly punctate, distinctly alutaceous throughout between the punctures. Elytra not more than one-

eighth longer than wide, strial punctures moderately coarse, intervals feebly convex, wider than the striæ on the disk, scarcely so at sides, finely transversely wrinkled. Legs pale, femora more distinctly punctate than usual. Length 2 mm.; width 1.2 mm.

A good series of this very fine species was taken at Redwood Park, California, by my friend Mr. J. O. Martin, to whom it is a pleasure to dedicate the species.

Of our previously described species, *puncticollis* alone possesses an equally broad form, but in it the thorax is much less conspicuously narrowed behind than in *martini*, and the surface is not alutaceous. The terminal joint of the maxillary palpus in the present species is unusually short, not, or only just perceptibly longer than wide, not narrowed apically, the tip broadly arcuato-truncate. In this respect it differs from every other species with which I have compared it, though most nearly approached by *puncticollis*. In this connection it may be remarked that the very unique marine *Ochthebius lapidicolus*, recently described by Van Dyke, has also aberrant maxillary palpi, the terminal joint very small, short and pointed.

*O. fossatus* Lec. An examination of the type of this species described in 1855 from Ft. Yuma, Cal., shows that it is not the same as *nitidus*, with which it was united by LeConte, but is really identical with the closely allied *tuberculatus* and *foveicollis*, described in 1878, the former from New Mexico, the latter from Florida. Horn correctly united *tuberculatus* and *foveicollis* in his revision of the genus in 1890, choosing to retain the latter name, although *tuberculatus* takes page precedence. Both these names, therefore, fall into synonymy, and *fossatus* must be restored to the List.

*O. nitidus* Lec. This seems the proper place to say that the drawing of the thorax of this species, Fig. 7, in the plate accompanying Horn's paper shows that the author must have had something entirely different in hand. The thorax in *nitidus* is closely similar to that shown of *foveicollis*, Fig. 2, differing only in the discal foveæ being smaller and more widely separated. The textual description of the thorax harmonizes completely with the plate; in the description of the elytra, however, special mention is made of the unusually smooth apex, which is the most characteristic feature of the true *nitidus*. Whether this latter character was taken from the specimen in hand or was merely transcribed from LeConte is now a question.

**Saprinus rugosifrons,** sp. nov. (Horn's Group IV).

Rather broadly oval, convex, polished black, the legs dark rufous. Head rather densely substrigosely rugose, marginal stria feebly traceable at sides of the front. Prothorax distinctly less than twice as wide as long, punctures rather closely placed throughout, rather abruptly longitudinally strigose in about the lateral fifth, much finer toward the middle, with coarser punctures along the base, and a few in a vague longitudinal median impression, which is most evident basally. Elytra about one-third wider than long, sides broadly arcuate, more strongly so about the humeri, finely punctate basally, becoming gradually more densely and coarsely so at apex, where the interstitial surface is finely alutaceous. First dorsal stria attaining the apical fourth; second, third and fourth striæ progressively slightly shorter, the fourth arcuately joining the sutural which is slightly abbreviated at apex; oblique humeral well impressed

and almost attaining the internal subhumeral which parallels the posterior half of the first dorsal; external subhumeral entirely distinct from the marginal. Pygidia alutaceous, closely punctate, with a slight tendency toward substrigosity, especially at apex. Prosternum moderately convex at summit, striæ long, parallel, abbreviated in front. First ventral plate concave at middle and with a small tubercle near its posterior margin; last ventral with a transverse flattened tumidity which is obtusely prominent at its lateral limits.

Length (to elytral apex) 3.15 mm. Width 2.6 mm.

Aweme, Manitoba. A single example sent by Mr. Norman Criddle. This species is to be placed near *obscurus* of Horn's Group IV. It is at once separable from any described species of the group by its rugose front and strigose sides of the pronotum. The remarkable ventral modifications are without doubt sexual in nature.

**Saprinus castanipennis,** sp. nov. (Horn's Group IV).

Broadly oblong-oval, black, elytra castaneous, legs rufous, surface polished throughout. Head finely, rather closely, punctate. Prothorax and elytra punctate over the entire surface, sparsely finely so medially, the punctures becoming much coarser and closer at the sides of the thorax where they are separated by less than their own diameters, also toward the elytral apex where they are of the same size as at the sides of the thorax, but separated on the average by their own diameters. Prothorax a little less than twice as wide as long, sides rather strongly convergent and straight in basal two-thirds. Elytral striæ strong, rather feebly punctate, first attaining the apical fourth, second and third nearly as long, fourth nearly reaching the apical third, strongly arched at base and joining the entire sutural. Pygidia rather densely punctate. Prosternum moderately convex, the striæ parallel and terminating about one-fourth from the apex. Anterior tibiæ multispinulose.

Length 2.3 mm. to the elytral apex, 2.5 mm. over all; width 1.85 mm.

Aweme, Manitoba, 21–VI–1918, (Criddle).

Judging from the description this species is nearest Casey's *laramiensis*, which is, however, a much larger insect (3.–3.4 mm.) with darker legs and with the thoracic punctuation "only slightly closer laterally."

**Saprinus iris,** sp. nov. (Horn's Group VIII).

Not very broadly oval, polished areas with viridi-aeneo-cupreous lustre, the dull punctured areas bluish, legs dark rufo-piceous. Head smooth, a feeble transverse impressed line above the frontal margin. Prothorax nearly twice as wide as long, sides moderately converging and feebly arcuate, surface not densely strigoso-punctate at sides and in front, leaving a triangular discal polished impunctate area; side margins very narrowly smooth, base with the usual coarse marginal punctures. Elytra rather more than one-fourth wider than long; striæ finely punctate, the first nearly as long as the elytra and curved at its extremity, second three-fourths as long as the elytra, the third and fourth slightly passing the middle; fourth hooked at base, sutural interrupted widely at base in the type, feebly joining the fourth stria in a second specimen; oblique humeral fine and nearly parallel with the first stria; internal subhumeral occupying the middle third of the elytra, with basal appendix nearly joining it to the oblique humeral; external subhumeral not distinct from the marginal; disk rather finely, not densely punctate in somewhat less than apical half, the punc-

tured area finely alutaceous and dull, the impunctate area between the first and fourth striæ also slightly dull owing to an extremely fine, scarcely visible ground sculpture; area between the fourth striæ highly polished. Propygidium and pygidium evenly rather closely punctate, the punctures becoming gradually a little smaller toward the pygidial apex. Prosternal lines approximate, gradually convergent anteriorly, becoming subconfluent and evanescent at about the anterior fourth.

Length (to elytral apex) 2.1 mm.; width 1.75 mm.

Described from two examples submitted by Mr. Norman Criddle, who took them at Aweme, Manitoba, V–31–1909 (type) and VII–1–1915. I thought on first sight that these might be small specimens of the rare *seminitens* of LeConte, to which they are certainly allied. On comparing them, however, with the unique type of the latter I find it to be not only much larger, but also a much more coarsely and densely sculptured species with brown bronze surface lustre (not at all bluish) external subhumeral stria distinct from the marginal, the fourth stria joining the sutural and strongly impressed all the way around. None of the more recently described species of Blatchley, Wolcott and Casey agree very closely with the present one.

**Telephorus neglectus,** sp. nov.

Very similar to *carolinus* with which it is likely to be found mixed in most collections. It may easily be recognized by the following comparative characters.

| *Neglectus.* | *Carolinus.* |
|---|---|
| Size smaller, averaging 8–9 mm. | Size larger, averaging 9–10 mm. |
| Antennæ a little shorter, joints 4–10 each, about three times as long as wide. | Antennæ a little longer, joints 4–10, about four times as long as wide. |
| Front, before the antennæ, broadly infuscate. | Front, before the antennæ more narrowly infuscate at middle |
| Prothorax more strongly transverse. | Prothorax less strongly transverse. |
| Claws with a rather strong but acute basal tooth. | Claws "cleft"; the basal tooth long and narrow. |

The types (♂, ♀), mounted on one pin, bear labels "Framingham, Mass., V–23–10, C. A. Frost and "Beating oak." Other specimens before me are from Sherborn, Hopkinton and Tyngsboro, Mass., and Berkely, R.I. I am indebted to Mr. Frost for calling my attention to the difference in the claws, which led him to separate his *carolinus* material into two species. The two species are about equally common in Eastern Massachusetts, and it would be interesting to know how widely *neglectus* is dispersed beyond the type region. The form with cleft claws, which is doubtless the true *carolinus*, is quite widely diffused, the material in my own cabinet ranging from New England to Nebraska and North Carolina.

**Pedilus parvicollis,** sp. nov.

Very elongate; black; prothorax, labrum and front coxæ rufotestaceous; palpi dusky testaceous; legs varying from brown to piceous, the tarsi paler. Head rather small, tempora wanting, eyes large, separated by a distance equal to their own width as viewed from the front; front closely punctate, vertex and occiput sparsely so. Antennæ (♂) strongly flabellate; joint 1 of the usual form, 2 very short, transverse, 3 equal to 1 and 2 united and with a branch slightly shorter than its own length, 4–10 shorter, the outer ones with branches about four times their own length, 11 about as long as the branch of the preceding joint. Prothorax of same width as the head, sides strongly rounded before the middle, oblique and nearly straight posteriorly, surface polished and rather finely sparsely punctate. Elytra nearly parallel, nearly twice as wide and six times as long as the prothorax, less finely and more closely punctate than the latter. Pubescence fine and sparse. Body beneath shining, finely punctate, last ventral segment very broadly obtusely rounded posteriorly. Claws with a small obtuse basal angulation.

Length 6 to 7 mm.

*Habitat.*—California Sierras.

Described from four males, two of which, including the type, were taken by Mr. G. R. Rilate at Monache Meadows, Tulare Co., 8,000 to 8,300 feet.; the other two by Mr. Hopping at Round Meadow in the Giant Forest region. This species can only be compared with *P. flabellata*, with which alone it agrees in the flabellate male antennæ and in the form of the thorax. In *flabellata*, however, the antennal rami begin on the fourth joint, the third being small and similar to the second, and the prothorax is relatively larger with the sides less strongly rounded than in the present species. The absence of tempora, and the head and thorax of equal width distinguishes *parvicollis* from every other species of our fauna.

## GIFT TO THE LIBRARY.

The Rev. Dr. Fyles, of Ottawa, a Life-member and former President of the Entomological Society of Ontario, has most generously presented to the Library a remarkable original work, "as a token of his appreciation of the great pleasure and profit his connection with the Society has afforded him." It is a large folio volume, handsomely bound in leather and entitled, "Illustrations in Natural History." It contains 107 water-colour drawings, chiefly of insects but including a few depicting flowers, birds, reptiles and other animals. The pictures were originally prepared to illustrate popular lectures, and are accordingly of large size and strikingly coloured in order to be visible to the whole of a numerous audience. Many of them were exhibited for this purpose at the annual meetings of the Entomological Society. The volume is a highly-prized addition to our Library, and will serve as a lasting record of the author's artistic skill and devotion to nature in all its aspects. To many also it will bring back memories of delightful addresses by the now venerable author. — C. J. S. Bethune, Librarian.

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### Collecting Terrestrial Arthropods in Barbados and Antigua, British West Indies.

by dayton stoner, iowa city, iowa.

(Continued from p. 178.)

### II. ANTIGUA.

The island of Antigua is situated in latitude 17° 6′ N., and is the principal island of the Leeward group of which it is the political capital. It is roughly oval in outline, twenty-four miles long by about fifteen broad, with an area of 108 square miles and a population of about 36,000. The central part of the island is low and flat and the soil more or less clayey; the southern and southwestern parts, in the vicinity of English Harbour, where a large share of the collecting was done, are volcanic and mountainous and covered, in many places, with dense forests. The greatest elevation is about 1,500 feet. To the north and northeast the soil is composed of calcareous marls and coarse sandstones.

Extended periods of drought often visit the island, and the average annual rainfall is a little less than fifty inches. As a result of the nature of the soil and the protracted dry periods the uncultivated vegetation is largely of a xerophytic nature. However, the soil where it can be worked at all is fertile and retains well the small amount of moisture. Sugar is the principal industry although corn, yams and pineapples are cultivated on a small scale.

Antigua is not under so high a state of cultivation as is Barbados; neither is it so thickly populated as that island; natural enemies of insects are not numerous—all these conditions make for a more abundant and varied insect fauna than we found at Barbados.

The majority of native Antiguans living in the rural districts and small villages are extremely poor, but they are neither so inquisitive nor so insistent on offering their services in collecting specimens as are the Barbadian negroes. This was a great relief to us, and much less trying on our temper and vocabulary.

While the Imperial Department of Agriculture maintains some of its activities on Antigua there is at present no resident entomologist, and we came upon none of the inhabitants of the island who were particularly interested in entomology as a science.

Of the lower forms of terrestrial Arthropods, scorpions and tarantulas, as well as other forms of Arachnids, are abundant. In low-wooded areas, under dried leaves, we found considerable numbers of a large brachypterous cockroach, but in reaching out to seize these agile fellows it was necessary for the collector to look sharply in order to make sure that a scorpion or two did not lurk close enough to be dangerous. Centipedes are not uncommon in moist places.

In addition to the large cockroach above mentioned, two other forms, *Periplaneta australasiæ* and *P. americana* are also very common. A greater

variety of both Acridiids and Locustids was secured here than at Barbados, the large *Schistocerca pallens* being among the former. The Phasmid *Bostra maxwelli* is very common in some portions of the wooded districts.

There are few fresh-water streams and ponds on Antigua. However, one of these ponds, situated about three-fourths of a mile from the Dockyards at English Harbour, was made the object of a rather intensive study. Among the more interesting forms of insect life found here is the mole cricket (*Gryllotalpa* sp.) which we had not discovered at Barbados. The mud shores of the little pond in some places were literally undermined by the tunnels of these peculiar insects. Other groups represented in the pond were Gerrids, Notonectids, Hydrobatids, Belostomids, Hydrophilids and Dytiscids, dragon-fly and damsel-fly larvæ and adults, various species of dipterous larvæ—in fact, the place was found to be a veritable storehouse of interesting entomological material. Of course, such ponds offer excellent breeding places for mosquitoes, and we found great numbers of both larvæ and pupæ. Needless to say, mosquito nets are a part of the furnishings of every well-ordered house on the island.

The low, grassy lands towards the centre of the island furnish a great variety of insects, particularly in Hemiptera and Orthoptera, and collecting with a sweep net was very productive of results in such situations.

At the south end of the island, where most of our collecting was done, many localities are heavily wooded. Small cultivated and semi-cultivated places on both high and low lands offer excellent collecting grounds. In many places highly xerophytic conditions prevail, particularly on the hills in the in the vicinity of English Harbour. Here the soil is very thin, although it is able to support many harsh and spiny plants. On the mud flats near the harbour at the foot of the hills are to be found great numbers of the elusive tiger-beetle *Cicindela trifasciata* var. *tortuosa*. The same white form (*C. suturalis* var. *hebræa*) that we found at Barbados was also discovered on the sand beaches at Half Moon Bay.

In walking through the wooded districts about Antigua the newcomer is at first struck by the great number of what appear to be climbing vines on the trees. Upon closer examination it is discovered that these "vines" are really the covered galleries through which the termites travel from place to place. These tunnels are everywhere, winding about over the trunks and branches of the trees, and usually terminate in a nest of some size either on the ground or in the trees themselves. The termites are usually sightless, and, being averse to the light, construct tunnels when it becomes necessary to cross an open surface. Both the nests and tunnels are made of pellets of chewed wood fastened together with sticky saliva secreted by the insects, and turn grayish after short exposure to the elements. When thoroughly dry the nests are very tough and resistant, being of about the consistency of hard rubber. The galleries are much more fragile

A most interesting and, to the writer, unusual place in which to find insects is in the great epiphytes or air plants locally known as wild pineapples which grow, sometimes in great numbers, on the manchineel and other trees in the wooded districts. Upon carefully removing one of these "pines" from the tree to which it is ordinarily loosely attached and turning it upside down, the collector is often well repaid for his efforts. Spiders, scorpions, beetles and cock-

roaches are sure to be found. The large leaves of this plant form a receptacle for water, and it is not an uncommon occurrence to find mosquitoes, both larvæ and adults, in such situations.

Among the commonest insects on Antigua are cotton-stainers (*Dysdercus* spp.) of which two or three forms occur on the island. Adults were found in copula in late June and early July at which times also nymphs in all stages of development were taken, particularly along the edges of cultivated fields and on low grasses in open places near woods. By preference these bugs feed on the bolls, seeds, leaves and tender shoots of the cotton plants, but when cotton is lacking they will feed upon other related plants. In addition to lessening the vitality of the plant by extracting the juices, cotton-stainers have been found to transmit a fungous disease which has become serious in some of the islands of the West Indies. Indeed, these pests are responsible, in large measure, for the almost complete abandonment of the cotton-growing industry in Antigua. The name stainer arises from the fact that the cotton lint is discoloured by the excrement of the insects and by the fungous disease which gains entrance through the punctures as well as by the crushing of the insects themselves in the gins.

Other kinds of Hemiptera, both Homoptera and Heteroptera, were taken in great numbers from the grasses and bushes in the cultivated and partly cleared areas all over the island. In fact, the hemipterous fauna exceeded that of any other group of insects, both in variety and abundance. One of the principal families of Heteroptera represented is the Pentatomidæ, of which more than fifteen species were taken. Of these, *Solubea pugnax*, *Piezodorus guildinii* and *Euschistus crenator* are perhaps most generally abundant. In favourable localities *Mormidea vosilon* is often abundant on Solanaceæ. Open fields in the central flats yielded great numbers of *Thyanta antiguensis*, and on the low grass within the crumbling walls of Fort Barclay the peculiar *Mecidea longula* was extremely abundant. A colony of the beautiful steel blue and red *Vulsirea nigrorubra* was found on a small tree along a trail leading through the woods.

The cleared spaces in and near the woods offer good collecting grounds for butterflies. On ascending Monks Hill from the south side by one of the numerous trails great numbers of gaily coloured Hesperids, Nymphalids and Lycaenids are to be found in the neighbourhood of the little truck patches.

In the low cultivated fields along the hills great numbers of larvæ and adults of the boll-worm (*Heliothis* sp.) and the cutworm (*Prodenia* spp.) were found, and some injury was being done to various plants, including corn and sweet potatoes. In such places also the familiar *Chrysopa* larvæ and adults are very common. Small Chrysomelids are not uncommon, *Homophæta æquinoctialis* and *Chaetocnema* sp. being among them.

Very often moths of different kinds were attracted by the lights in our quarters at night, the most notable of these being several forms of *Protoparce* and a specimen or two of the interesting noctuid, the black witch (*Erebus odora*).

With such a variety of habitats and faunas represented, collecting was indeed a pleasure, and many localities still remained to be investigated at the expiration of our allotted time upon this interesting tropical island. Although one often associates large, striking or bizarre forms of insect life with tropical countries, particularly with tropical islands, such forms are, with few exceptions, lacking on both Barbados and Antigua.

A great mass of material was secured, and as soon as it is put into proper shape for examination will be submitted to specialists for detailed study and report. As might be expected, the Antiguan material is much in excess of that secured at Barbados.

## FOUR NEW AFRICAN MEMBRACIDÆ.*

BY W. D. FUNKHOUSER, LEXINGTON, KY.

1. **Anchon gunni,** sp. nov. (Figs. 1 and 2).

Near *A. nodicornis* Germar but lacking the anterior tooth on the angle of the posterior process, and differing in the markings of the pronotum and tegmina.

Slender, black, punctate, sparingly pubescent; densely white tomentose behind suprahumeral horns and on sides of thorax; suprahumeral horns long, broadly foliaceous at tips which are strongly decurved and sharply pointed; posterior process strongly angular at base, depressed at centre, tip just reaching apex of abdomen; scutellum about as long as broad, strongly bidentate at tip; tegmina smoky-hyaline with ferruginous margins; legs and under surface of body brown, tarsi flavous.

Head broader than long, finely punctate, rather densely pubescent with white hairs; base strongly convex, slightly sinuate; eyes prominent, gray-black; ocelli large but not conspicuous, sordid gray, about equidistant from each other and from the eyes and situated about on an imaginary line drawn through centres of eyes; inferior margin of genæ strongly sinuate; clypeus twice as long as wide, black, punctate, pubescent, extending for more than half its length below inferior margins of genæ, tip rounded and weakly pilose.

Pronotum black, finely punctate, rather sparingly pubescent with white or silvery hairs; metopidium perpendicular, somewhat convex, about as broad as high, narrowest at bases of horns; humeral angles very prominent, triangular, acute; median carina strongly percurrent; suprahumeral horns long, narrow at base but broadly foliaceous at tip, practically contiguous at bases, extending upward and outward, the tips flattened, triangular, sharp, and suddenly bent outward and backward; posterior process rising well above scutellum, then bent sharply backward, sloping downward to meet internal angles of tegmina and then following margins of tegmina to a point about as far caudad as the end of the abdomen, tip very sharp and slightly decurved; scutellum about as long as broad, black, punctate, gradually narrowed towards the apex which is strongly bidentate; a dense linear patch of white tomentose pubescence extends backward from the posterior base of each suprahumeral horn over the pronotum and on to the base of the scutellum.

Tegmina long, narrow, smoky-hyaline, much wrinkled; base narrowly brown, punctate and pubescent, internal apical margin tinged with ferruginous; tips pointed: costal margin not marked with brown; five apical and two discoidal cells. Hind wings with three apical cells.

Under surface of body dark brown; sides of mesothorax and metathorax densely white tomentose; hind trochanters not armed with spines; femora and tibiæ brown; tarsi flavous; claws brown.

*Contribution from the Zoological Laboratory of the University of Kentucky.
October, 1919

Length including tegmina 7 mm.; width between tips of suprahumeral horns 5.8 mm.

*Type*.—Female.

*Locality*.—Pretoria, South Africa.

Described from a specimen collected by Mr. David Gunn on January 8, 1915. Type in author's collection. I take pleasure in dedicating this species to Mr. Gunn, who has so kindly furnished me with a large number of interesting species of Membracidæ from South Africa.

The genus *Anchon* is apparently well represented in South Africa. Mr. Gunn has sent me specimens of *A. senegalensis* Fairm., collected at the same locality and at the same time as the above.

2. **Anchonoides minutus,** sp. nov. (Figs. 3 and 4).

Small, black, punctate, densely pubescent; suprahumeral horns short and very thick; posterior process raised above scutellum, strongly sinuate but not angulate, extending beyond internal angles of tegmina but not reaching apex of abdomen; scutellum entirely exposed, longer than broad, bidentate; tegmina smoky-hyaline faintly tinged with ferruginous, base brown; under surface of body black; legs dark brown with tibiæ somewhat ferruginous and tarsi flavous.

Head wider than long, black, finely punctate, densely pubescent, much swollen in front; base convex and sinuate; eyes large, prominent, brown; ocelli small, pearly, conspicuous, somewhat protruding, about equidistant from each other and from the eyes and situated about on a line drawn through centres of eyes; inferior margins of genæ sinuate, lobed at margins of clypeus; clypeus longer than wide, extending for half its length below inferior margins of genæ.

Prothorax very dark brown in front, black behind, finely punctate, very densely pubescent with silvery hairs; metopidium higher than wide, narrowest at base of suprahumeral horns, brown on upper two-thirds, black just above head, very roughly sculptured, swollen along central line; median carina percurrent; humeral angles large, prominent, triangular, acute; suprahumeral horns very thick, heavy, short, roughly quadricarinate, extending almost directly outward, about as long as the distance between their bases, tips sharp and decurved; posterior process long, very slender, strongly sinuate, smooth, tricarinate, base raised high above scutellum, tip sharp and decurved, extending beyond internal angles of tegmina but not reaching apex of abdomen; scutellum entirely exposed, a little longer than wide, brown, punctate, densely pubescent, gradually narrowed toward tip which is strongly bidentate, a linear white tomentose patch extending backward over the pronotum from the base of each suprahumeral horn and covering external basal angle of scutellum.

Tegmina smoky-hyaline, wrinkled; a ferruginous spot at internal angle, another at distal end of basal costal cell and a faint fascia at apical margin; base brown, coriaceous and punctate; tip rounded; veins strong, ferruginous, marked with brown in central areas; four apical cells. Hind wings with three apical cells.

Under surface of body black; sides of thorax densely pubescent; margins of abdominal segments ferruginous; coxæ, trochanters and femora dark brown, tibiæ ferruginous and minutely spined, tarsi flavous.

Length including tegmina 5 mm., width between tips of suprahumeral horns 3 mm.

*Type*.—Female.

*Locality*.—Pretoria, South Africa.

Described from a specimen collected by Mr. David Gunn on Nov. 3, 1914. Type in author's collection.

3. **Otinotus pilosus,** sp. nov. (Figs. 5 and 6).

Large, brown, very densely pilose; suprahumeral horns short, heavy, blunt, extending outward and upward and no longer than the distance between their bases; posterior process long, slender, sinuate, impinging on tegmina and extending to a point about half-way between internal angles and apices of tegmina; tegmina hyaline, wrinkled, base narrowly brown; legs and under surface of body uniformly brown.

Head twice as wide as long, subquadrate, dark brown, finely punctate and densely pubescent; base sinuately convex; eyes large, prominent, brown; ocelli large, prominent, glassy, transparent, considerably nearer to each other than to the eyes, and situated about on a line drawn through centres of eyes; inferior margins of genæ rounded; clypeus nearly three times as long as wide, extending for three fourths its length below inferior margins of the genæ, margin adjoining genæ angulate, tip broadly rounded.

Pronotum dark brown, finely punctate, densely pilose with yellowish hairs; metopidium about as broad as high, nearly perpendicular above the head, slightly convex; median carina distinctly percurrent; humeral angles very large, prominent, triangular, blunt, extending almost as far lateral as the suprahumeral horns above them; suprahumeral horns short, heavy, blunt, somewhat compressed dorso-ventrally, strongly tricarinate, extending outward and slightly upward, tips as seen from above roughly truncate; scutellum well exposed on each side, apex yellow, smooth and bidentate, base ferruginous, punctate and densely pilose; posterior process long, slender, sinuate, tricarinate, impinging on tegmina, base not elevated above scutellum, tip acuminate, decurved and black, extending to a point about half-way between internal angle and apex of tegmen but not reaching extremity of abdomen.

Tegmina hyaline, wrinkled; base narrowly brown, coriaceous and punctate; tip pointed; five apical cells. Hind wings with four apical cells.

Legs and under surface of body uniformly dark ferruginous brown; sides of thorax densely white tomentose; tibiæ closely pilose with long, white, bristly hairs.

Length including tegmina 9 mm.; width between tips of suprahumeral horns 4.7 mm.

*Type*.—Female.

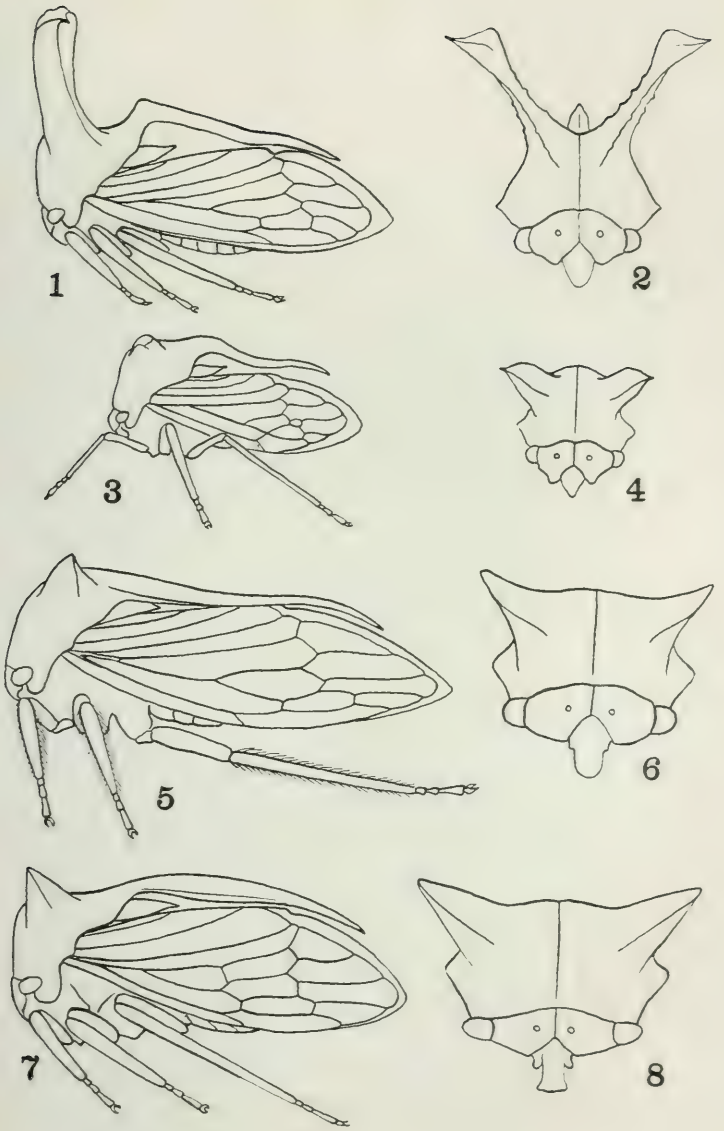
*Locality*.—Dutch East Africa.

Type in author's collection.

This species is apparently close to *O. nigrorufus* Distant, but differs in colour, in the markings of the tegmina and in the structure of the base of the posterior process.

4. **Otinotus arcuatus,** sp. nov. (Figs. 7 and 8).

Large, robust, ferruginous-brown; suprahumeral horns short, pyramidal, sharply angular, extending outward and upward and about as long as the distance between their bases; posterior process long, heavy, strongly arcuate, the




NEW AFRICAN MEMBRACIDAE.

base slightly raised above the scutellum, tip sharp and extending to a point about midway between internal angles and tips of tegmina; tegmina sordid hyaline, wrinkled, base brown and punctate; legs and under surface of body ferruginous-brown.

Head twice as broad as long, bright reddish brown mottled with black, roughly sculptured, sparingly punctate, sparsely pubescent with silvery hairs; base regularly rounded; eyes large prominent, dark brown; ocelli large, reddish, somewhat protruded, conspicuous, much nearer to each other than to the eyes and situated about on a line drawn through centres of eyes; inferior margins of genæ nearly straight, sloping downward; clypeus nearly three times as long as wide, lobed at angles of genæ, extending for three-fourths its length below margins of genæ, tip swollen and subtruncate.

Pronotum reddish brown, finely and closely punctate, sparingly pubescent with whitish hairs; metopidium broader than high, swollen in centre, perpendicular above the head, a large irregular callosity above internal angle of each eye; median carina strongly percurrent; humeral angles large, prominent, triangular, blunt; suprahumeral horns short, straight, heavy, strongly tricarinate, acute, extending outward and upward, about as long as the distance between their bases; scutellum broadly exposed on each side, brown, punctate, pubescent, gradually narrowed to apex which is smooth, white and bidentate; posterior process long, heavy, strongly arcuate, tricarinate, the base slightly upraised above scutellum, the tip acuminate and extending to a point about midway between internal angles and apices of tegmina, but not nearly reaching extremity of abdomen.

Tegmina hyaline, wrinkled; base brown, coriaceous and punctate; veins prominent and brown; no maculations; five apical cells. Hind wings with four apical cells.

Legs and under surface of body uniformly ferruginous-brown; sides of thorax densely white pubescent.

Length including tegmina 8 mm.; width between tips of suprahumeral horns 5.8 mm.

*Type*.—Female.

*Locality*.—Pretoria, South Africa.

Described from two females collected by Mr. David Gunn on January 11, 1915. Type and paratype in author's collection.

The South African species of the genus *Otinotus* bear a strong superficial resemblance to the old genus *Centrotus* (Fabr.), but may be at once separated from the genus by the difference in the number of apical cells of the hind wings.

## Explanation of Plate XIX.

Fig. 1. Lateral outline of *Anchon gunni*, sp. nov.
2. Frontal outline of *Anchon gunni*, sp. nov.
3. Lateral outline of *Anchonoides minutus*, sp. nov.
4. Frontal outline of *Anchonoides minutus*, sp. nov.
5. Lateral outline of *Otinotus pilosus*, sp. nov.
6. Frontal outline of *Otinotus pilosus*, sp. nov.
7. Lateral outline of *Otinotus arcuatus*, sp. nov.
8. Frontal outline of *Otinotus arcuatus*, sp. nov.

# REPORT ON A SECOND COLLECTION OF NOVA SCOTIAN EUPTERYGID LEAF-HOPPERS, INCLUDING DESCRIPTIONS OF NEW VARIETIES.

BY W. L. MCATEE, WASHINGTON, D.C.

Like a previous collection* sent to the writer by Professor W. H. Brittain, Provincial Entomologist of Nova Scotia, the present is reported upon in print, because it contains undescribed forms. All specimens are in the collection of the Nova Scotia Department of Agriculture.

LIST OF SPECIES.

*Alebra albostriella* var. *fulveola* Herrich-Schäffer.—Digby Co., N. S., Aug. 14, 1918.

*Empoasca atrolabes* Gillette.—Digby Co., N.S., Aug. 3, 1918.
" *obtusa* Walsh.— " " " " 15, "
" *pergandei* Gillette.— " " " " 3, "
" *unicolor* " " " " " 15, "

**Typhlocyba querci** Fitch.

This is a robust *Typhlocyba*, measuring up to 5 mm. in length. The length of vertex in proportion to width of space between inner margins of eyes (synthlipsis) is as 7–8: 14–16. The ground colour usually is pale yellow.

The colour varieties including those hereafter described may be separated by the following key:

A. Elytral markings in the form of small dusky spots.
  B. With spots only in apices of the discal cells of elytra.....var. *querci* Fitch.
  BB. With three pairs of spots along the commissural margin.....var. *6-notata* Van Duzee.
AA. Elytral markings in the form of cross-bands or lengthwise vittæ.
  C. The most conspicuous markings are cross-bands.
    D. Anterior cross-band narrow, directed backward on the sides. (var. *bifasciata* Gillette and Baker now called).....var. *gillettei* Van Duzee.
    DD. Anterior cross-band broad, directed forward on the sides.....var. *volans*, n. var.
  CC. The most conspicuous markings are lengthwise.
    E. Clavus except extremities and adjacent corium dusky; no posterior cross-band.....var. *grata*, n. var.
    EE. Elytron with a lengthwise streak connecting anterior and posterior cross-bands.....var. *scripta*, n. var.

In the present collection are represented:

*Typhlocyba querci* var. *querci* Fitch.—Digby Co., N.S., Aug. 3, 1918.

*Typhlocyba querci* var. *gillettei* Van Duzee.—Digby Co., N.S., Aug. 8, 1918; Victoria, B.C. July 17, 1918.

**Typhlocyba querci** var. **volans**, new variety.

With two dusky cross-bands, much broader than in variety *gillettei* Van Duzee, the posterior over the cross-veins, the anterior over middle of clavi, sloping forward on the corium parallel to anterior edge of elytron. In var.

*See Can. Ent., Vol. L, No. 11, 1918, pp. 360–361.

*gillettei* this band is narrower, nearer apices of clavi and slopes obliquely backward, not forward.

One ♀ specimen, Digby Co., N.S., Aug. 18, 1918.

**Typhlocyba querci** var. **grata,** new variety.

Scutellum dusky; elytra with a large dusky saddle-spot, occupying most of the clavi, and a portion of each adjoining corium; no posterior band or clouding.

One ♀ specimen, Digby Co., N.S., Aug. 14, 1918.

**Typhlocyba querci** var. **scripta,** new variety.

Scutellum chiefly dusky; elytra with dusky bands at middle and on cross-veins, as in var. *gillettei*, apical cells smoky, and with a longitudinal dusky stripe on clavus and overlying claval suture connected with band over cross-veins. These markings leave the margin anteriorly and the tip posteriorly, of the clavus, of the ground colour.

One ♀ specimen, Digby Co., N.S., Sept. 5, 1918.

*Typhlocyba rosæ* Linnæus.—Digby Co., N.S., Aug. 3, 5, 8, 13, 15, 1918; Truro, N.S., July 24, 1918; Royal Oak, B.C., Sept. 29, 1917.

*Erythroneura obliqua* Say.—Acaciaville, N.S., May 16, 17, 1917.

## DESCRIPTIONS OF FOUR CATOCALA LARVÆ.

BY R. R. ROWLEY, LOUISIANA, MO.

Among a number of mature Catocala larvæ, taken under the bark of hickory trees in the early part of last summer, a dozen or more proved of unusual interest, one a *lachrymosa*, previously undescribed, another a typical *obscura*, a third and fourth showing the slight differences between the closely related species *retecta* and *flebilis*, while still another gave *judith*, but the description was misplaced.

Other larvæ were of *angusi* and its variety *lucetta*, hardly distinguishable from *habilis*. Of six *angusi* moths, five were var. *lucetta*, only one being a typical *angusi;* a like ratio existing in the woods here between the variety and present form. The species, however, is usually rare.

*Catocala flebilis.*—Mature larva 2⅛ inches long, leaden gray with lighter tubercles. The mid-dorsal band lighter than the general body colour, constricted at the segment edges, forming a series of spots of chain-link appearance. The spots on the first, second and fifth abdominal segments bordered by a black encircling line (on three sides). A dark cross-band covers the back half of the fifth abdominal segment. A black-cross line behind the eighth abdominal segment. The sublateral line or narrow band is dark or quite black above the spiracles. True and pro-legs general body colour. The lateral line of setæ composed of so few and short bristles as to be hardly noticeable. Head gray, round, with short lateral mouth dash of black.

Ventral colour soiled white with faint red blotches about the row of mid-ventral black spots. Larva taken under bark of *Carya alba* (shag-bark hickory). Cocooned June 15th, and gave imago July 20th.

*Catocala retecta.*—Mature larva 2¼ inches long, dark leaden brown. A mid-dorsal longitudinal "chain link" like narrow band, a little lighter than the general body colour. Still narrower bands of darker hue bound the mid-dorsal band and, beginning with the second abdominal segment, these bounding bands

are very dark brown, almost black, for three or four segments. No dorsal hump. Lateral setæ very short. Head rounded, mottled gray and brown with a short, lateral black dash. Tubercles whitish. Ventral surface pale with greenish tinge except mid-ventrally where the black spots are set in pink patches. A wavy, longitudinal line or narrow band along the line of lateral setæ is dark or quite black.

Taken under the bark of *Carya alba* (shag-bark hickory). Spun cocoon June 11th, and gave imago July 15th.

*Catocala lachrymosa*.—Full-grown larva 2½ inches long, very dark brown with a lighter cross-band (irregular) over the first abdominal segment, and a less pronounced one behind the fourth pair of pro-legs. No dorsal hump. Head light gray mottled with darker markings. True and pro-legs dark. Tubercles very dark reddish brown. Lateral fringe of rather long bristles. Head round and full. Ventral surface pinkish, with the characteristic black spots. Larva taken under the bark of *Carya alba* (shag-bark hickory). Began spinning cocoon June 29th, and gave imago August 2nd.

*Catocala obscura*.—Larva 2½ inches long, leaden gray, with only dash lines No hump, no lateral row of setæ. Head round and streaked as in other hickory larvæ. Tubercles pale yellow or quite white, giving the body a speckled appearance. Ventral side of body white with tinge of green. Central row of black spots. Larva taken in hickory bark but fed through to maturity on pecan (*Carya olivæformis*).

Larva cocooned July 8th, and gave moth August 7th. The imago has white fringe on back wing.

## THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Fifty-sixth Annual Meeting of the Society will be held at Ottawa, Ont., on Thursday and Friday, the 6th and 7th of November. All the sessions will be held in the Carnegie Library, (Metcalfe Street). On the evening of November 7th the members and visitors will be the guests of the Officers of the Entomological Branch of the Dominion Department of Agriculture, at a smoker, the place of meeting to be announced later.

Members or visitors having papers which they wish to present will please send the title of the same to the Local Secretary not later than October 18th, and state time required for presentation. It is requested that no paper exceed 20 minutes in length. If a lantern is required this fact should also be stated.

L. Caesar, President, O.A.C., Guelph; A. W. Baker, Secretary, O.A.C., Guelph, Arthur Gibson, Local Secretary, Entomological Branch, Dept. Agric., Ottawa.

Charles W. Leng, Secretary of the New York Entomological Society and Research Associate in the American Museum of Natural History, has been appointed Director of the Museum of the Staten Island Institute of Arts and Sciences. Mr. Leng has been interested in the natural history of Staten Island, where he was born and lives, since boyhood. Entomologists and other naturalists, visiting New York City, can reach the Museum of the Institute by a pleasant half hour's sail across the bay on the Staten Island ferry, and thus inspect the collections in all orders that have been accumulated.

## MISCELLANEOUS APHID NOTES 1.

BY JOHN J. DAVIS, WEST LAFAYETTE, INDIANA.

### **Heteroneura,** new genus.

Erected for the species *Aphis setariæ* Thomas, which is herewith designated the type. The genus may be characterized as a typical *Aphis* excepting the venation of the hind wings which have but a single cross-vein (Fig. 26). The filament of antennal segment VI is quite long, being 6 to 8 times the length of the base of this segment. *Heteroneura* is analogous to *Carolinaia* in the venation of the hind wing and bears the same relation to the genus *Aphis* as *Carolinaia* bears to the genus *Rhopalosiphum* (*Siphocoryne*). The late Theo. Pergande recognized this as a distinct genus, and used the name here adopted on his slides of *setariæ*.

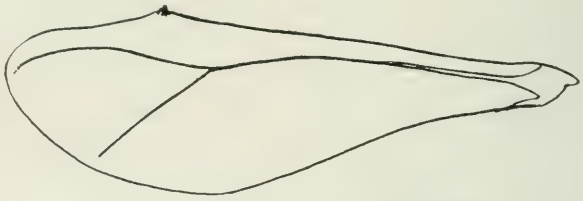


Fig. 26.—*Heteroneura setariæ* Thos. Hind wing.

*Aphis scotti* Sand.[1] is a synonym of *setariæ*. The description of *Aphis prunicoleus* Ashm.[2] is a clear characterization of this species and should be listed as a synonym. *Aphis bituberculata* Wilson [2a] is also a synonym of *setariæ* as determined by a comparison of the types by Wilson.

The writer's collection contains *setariæ* from Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, Missouri, New York, Oklahoma, South Carolina, Texas and Wisconsin and our host records include, in addition to the reported hosts, the following: corn, sugar cane, *Eragrostis* sp., *Sorghastrum nutans*, *Panicum capillare*, *Paspalum dilatatum*, and Bermuda grass (*Cynodon dactylon*).

### **Aphis heraclella,** n. n.

This new name is offered for *Aphis heraclii* Cowen, preoccupied by *Aphis heraclei* Koch.

### **Aphis rociadæ** Ckll.

What is considered the same as Cockerell's *Aphis rociadæ*[3] was found abundant on the flower stalks of *Delphinium tricorne* at Lafayette, Indiana, May 9, 1913. The original description included only the apterous female, but certain characters are so unusual and prominent there appears to be little question as to the identity of our species.

Winged viviparous female: Head, thorax and abdomen very dark brown, apparently black. At base of each cornicle brownish. In some specimens the abdomen is distinctly shining dark brown. Antennæ and eyes black. Legs pale brownish, blackish at apices of femora and tibiæ, and tarsi black. Cornicles moderately dark brown. Wing veins black.

1. Bull. Ga. St. Bd. Ent., No. 17, p. 99, Oct., 1905.
2. Pacific Rural Press, Vol. 22, No. 1, p. 8, July 2, 1881.
2a. Ent. News, Vol. 25, No. 7, p. 298, 1 pl., July, 1914.
3. Trans. Amer. Ent. Soc., Vol. 29, p. 115, 1903. I have since had an opportunity to identify this species with certainty by comparing with the type, kindly loaned by A. C. Baker.

Antennæ reaching to or beyond tip of abdomen; segment III with 4 to 8, usually 5, round sensoria, and segments V and VI with the usual ones; filament of VI quite long, being more than half longer than III and seven times the length of VI base (fig. 2a). Beak reaching almost to coxæ of third pair of legs. Cornicles (fig. 2b) of moderate length, being approximately half the length of antennal segment III, cylindrical, and flaring at the tip. Cauda (fig. 2c) broadly rounded and scarcely visible. Wing veins dark brown, the second branch of discoidal branching about ½ the distance from tip to where first branches.

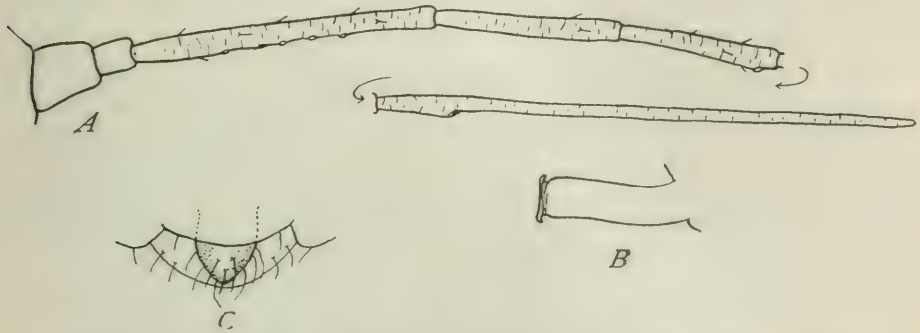



Fig. 27.—*Aphis rociadæ* Ckll. A, antenna; B, cornicle; and C, cauda, of winged viviparous female.

Wingless viviparous female: Entire body very dark shining brown, apparently black, excepting posterior end of abdomen which is of a slightly lighter brown. Antennæ apparently black excepting segment III, which is brownish. Legs as in winged female. Cornicles pale brown and black at tip. Cauda not apparent.

The antennæ similar to those of the winged female, except that they lack sensoria on segment III. Cornicles moderately short and cauda not exposed, but visible as a broadly rounded organ through the transparent body wall when mounted in balsam.

Since writing the above I have received from J. R. Parker sexes of what I believe may be this species, collected in Montana on larkspur. The males are winged and the noticeable differences from the winged viviparous female are as follows: Antennal segment VI, filament longer than III, but not one-half longer; segment III with 60 or 70 small, somewhat tuberculate sensoria, irregularly placed; IV with 12 or 15, and V with 10 similar sensoria; cornicles less prominent, being paler and less conspicuously shaped. The apterous oviparous female differs from the apterous viviparous as follows: Antennal segment VI filament, longer than III but not one-half longer; segment III with 15 to 20 small sensoria, irregularly placed on basal two-thirds; antennal hairs longer; cornicles as in male; and basal third of hind tibia swollen and bearing numbers of small inconspicuous sensoria.

**Aphis cuscutæ,** n. sp.

This typical aphis which appears to be undescribed, was collected by P. H. Timberlake at Kaysville, Utah, on dodder (*Cuscuta epithymum*) growing on alfalfa. Live specimens were received from Timberlake Oct. 21 and Nov. 10, 1914, from which the following descriptions are made.

It might be noted here that from this live material we reared (*Lysiphlebus*) *Aphidius testaceipes* Cress. (Gahan det.) and a syrphid (*Syrphus opinator* O. S., Aldrich det.).

Winged viviparous female: Head and thorax black, abdomen pale green with three dusky spots on each side anterior to the cornicles and one at the base of the cornicles, an impressed dusky dot on each side of each segment, a brighter green transverse area on each side of the dorsal median line of the segments anterior to the cornicles, a small dusky spot on the dorsal median line of the cornicle-bearing segment, and a similar transverse dusky to blackish marking on the penultimate and last abdominal segments. Antennæ black. Eyes dark reddish brown. Beak black at tips. Legs with femora pale dusky to blackish at tips, tibiæ brown to blackish at tips and tarsi black. Cornicles, cauda, and anal plate black.

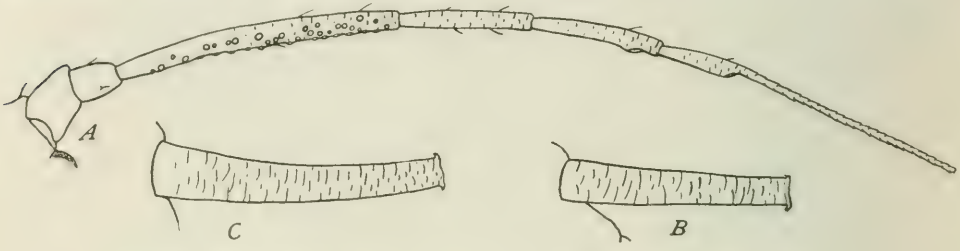



Fig. 28.—*Aphis cuscutæ*, n.sp. A, antenna; B. cornicle, of winged viviparous female; C, cornicle of wingless viviparous female.

Antennæ reaching about to base of cornicles, segments III and filament of IV subequal, the former being slightly the longer, III subequal in length to IV and V combined, segment III with about 40 to 50 circular, slightly tuberculate sensoria scattered irregularly over the surface, and the usual sensoria at distal end of segment V and VI base (fig. 3a). Beak not quite reaching to coxæ of the middle pair of legs. Wings normal, veins narrow, and blackish, the branching of the third discoidal nearer the tip than point where second branches. Cornicles moderately long and reaching just a little beyond tip of body in live specimens (fig. 3b). Cauda typical of the genus, being slender, conical and constricted near the middle. The prothorax with a tubercle which is hidden by the mesothorax in mounted specimens; also a rather prominent tubercle on each side of the first abdominal segment.

Measurements: (Averages) Length of antennal segments III, 0.508; IV, 0.238; V, 0.228; VI, base, 0.122; VI, filament, 0.405 mm.; cornicles 0.379 mm.; cauda, 0.151 mm.

Pupa: Head dusky, thorax pale yellowish green and abdomen marked as in apterous form, but lacking the black markings and bearing a row of rather conspicuous pulverulent spots on each side of the median dorsal line, and the entire body covered with a fine inconspicuous pulverulence. Antennæ dusky to blackish, excepting segment III and base of IV, which are whitish. Eyes dark reddish brown, almost black. Beak not quite reaching coxæ of middle pair of legs. Wing-pads blackish at tips. Legs whitish, the tips of tibiæ and femur and all of the tarsi blackish. Cornicles black and not quite reaching to tip of cauda. Cauda pale with an almost imperceptible duskiness.

Wingless viviparous female: General colour pale green (Smith colour key) and entire body covered with a very thin pulverulence. Head and prothoracic segment dusky to blackish, second thoracic segment dusky on either side of dorsum and a fainter dusky area connecting the two. Abdominal segments

anterior to cornicles with an impressed dusky dot on each side and a brighter green transverse marking on each side of dorsal median line; also marked with a black dot at base of each cornicle and a transverse dusky band on the dorsum of last abdominal segment. Antennæ black excepting basal two-thirds of III which is whitish. Eyes apparently black. Legs with fore pair whitish excepting at joints and the tarsi which are black; middle and hind pair similarly coloured except the femur is dusky to blackish. Beak pale with tip dusky to black. Cornicles black, and cauda pale greenish to blackish,

Antennæ with relative lengths of segments as in winged form, no sensoria excepting the usual distal ones on segments V and VI, base. Prothorax bearing a moderate tubercle near the base on each side. Beak reaching a little beyond coxæ of the second pair of legs. Cornicles moderately long, curved outwards (fig. 3c) and in live specimens reaching beyond tip of cauda. Cauda conical and typical of the genus.

Measurements: (Averages) Length of antennal segment III, 0.486; IV, 0.230; V, 0.226; VI, base, 0.122; VI, filament, 0.452 mm.; cornicles 0. 527 mm.; cauda 0.191 mm.

Cotypes in the collections of the U. S. and Canadian National Museums, and in the writer's collection.

**Siphonophora achyrantes** Monell.

The type slide (Monell number 125x) of the species described under this name was examined by Monell and the writer in February 1914, and it was

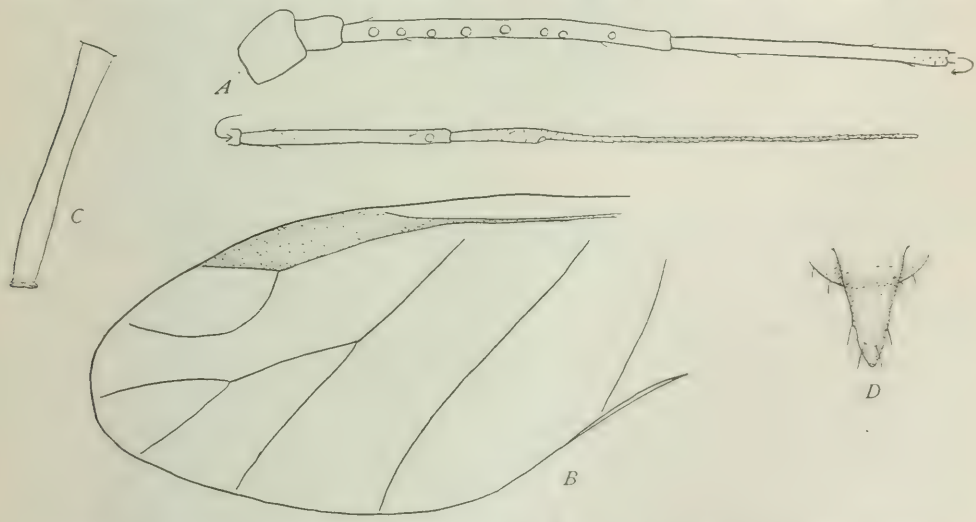



Fig. 29.—"*Siphonophora achyranthes* Monl." A, antenna; B, wing; C, cornicle; and D, cauda, of winged viviparous female. Drawn at St. Louis, Mo., Feb., 1914, from type specimen.

agreed that it was the same as *Myzus persicæ* Sulz. The frontal tubercles and abdominal markings were typical. Other important characters shown in the accompanying drawings (fig. 4) made from the type.

**Macrosiphum ribiellum**, n. sp.

What is here considered as a new species was originally described by the writer as *Marcosiphum cynosbati* Oestl.[4] Since writing this description the writer has had an opportunity to examine the type of *cynosbati*, and finds it

4. Studies on Aphididæ. Annals Ent. Soc. Amer., Vol. 2, 1909, p. 38, figs.

quite a different species, a typical Myzus. This species will be discussed in a following paragraph.

*M. ribiellum* (fig. 5) seems to be quite different from any previously described species occurring on *Ribes*. It is not a typical *Macrosiphum* but probably can best be placed in that genus. From other species occurring on *Ribes* it may be separated as follows. The slightly swollen cornicles and fewer sensoria on antennal segment III of the apterous distinguishes it from *Macrosiphum lactucæ* Schr. We are not familiar with *M. ribicola* Kalt., but Theobald gives it as a synonym of *M. lactucæ* Schr. *Rhopalosiphum lactucæ* Kalt. has much greater swollen cornicles which are conspicuously club shaped. Whether *R. sonchi* Oestl. is a synonym of *lactucæ* Kalt. is questionable in my mind. In examining specimens which appear to be typical *sonchi* collected on *Sonchus* and typical *lactucæ* collected on *Ribes*, I can make out no constant character to distinguish the two except that the filament of antennal segment VI in all my *sonchi* specimens is approximately one half longer than segment III, while in

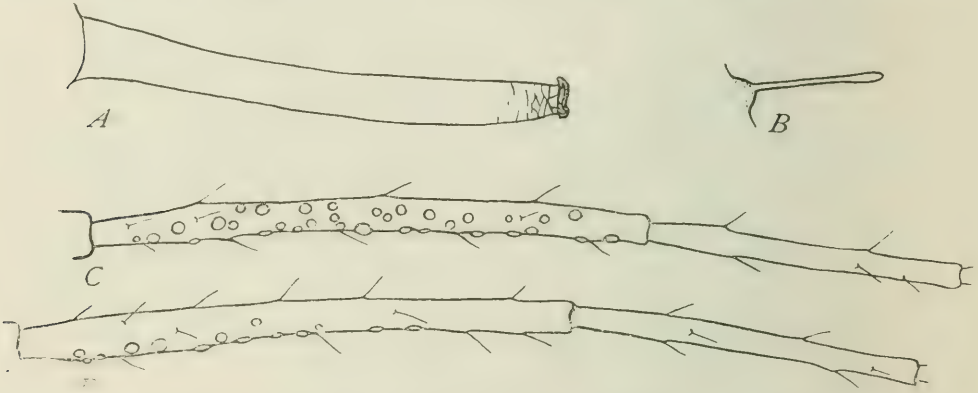
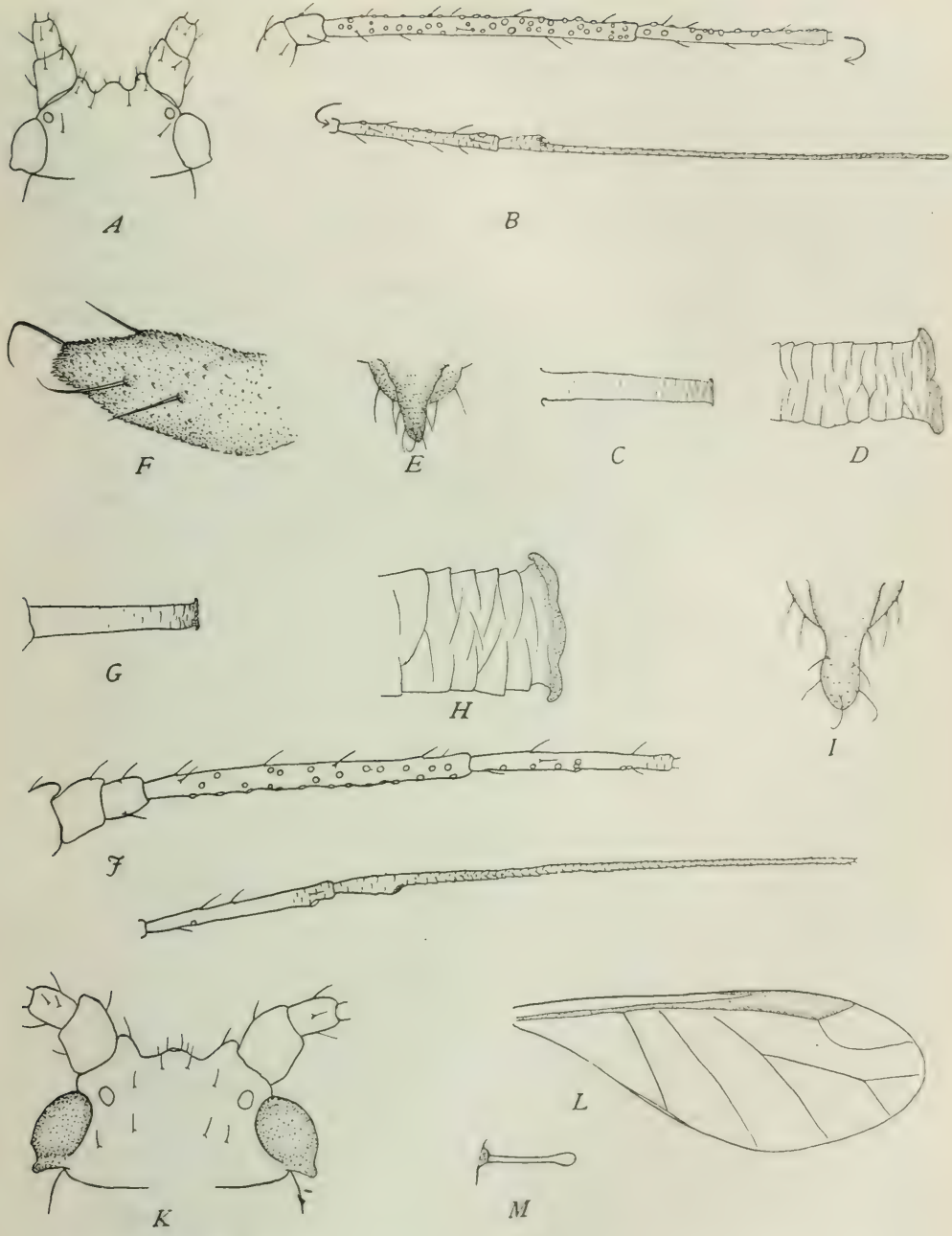



Fig. 30.—*Macrosiphum ribiellum*, n.sp.—A, cornicle of apterous viviparous female; B, antennal hair; C, antennal segments III and IV of winged viviparous female; D, antennal segments III and IV of apterous viviparous female.

*lactucæ* filament of VI is only very slightly (1/7 to 1/6) longer. *Rhopalosiphum brittenii* Theob. has large swollen cornicles like *lactucæ* which at once separates this species. *Myzus ribis* L. bears numerous sensoria on IV and V, and has very slender cylindrical cornicles which easily separate it from *Macro. ribiellum*. *Myzus whitei* Theob. is separated by the occurrence of a number of sensoria on IV and V, but resembles *ribiellum* in the character of the cornicles. *Myzus dispar* Patch also resembles *ribiellum* in the character of the cornicles, but *dispar* differs by having antennal segment VI filament twice the length of segment III. We have not seen *Rhop. ribesina* v. d. G., but the cornicles are said to be distinctly club-shaped and the antennæ to bear sensoria (10–15) on antennal segment IV. *Myzus cynosbati* Oestl. and *M. houghtonensis* Troop have more sensoria on segment IV and the cornicles are short, cylindrical and typical of many species of the genus *Myzus*. *Aphis* (*Myzus*) *neomexicanus* Ckll. is characterized by antennæ much shorter than body, cylindrical cornicles which do not reach tip of abdomen, and by black markings on abdomen of winged female. *Myzus ribifolii* Davidson is readily separated by the cornicles which are typically Myzus.




*Myzus cynosbati* Oestl. A, head; B, antenna; C, cornicle; D, tip of cornicle much enlarged; E, cauda; F, side view of cauda; much enlarged, of winged viviparous female. Drawn from type specimen in collection of Prof. O. W. Oestlund.

*Myzus houghtenensis* Troop. G, cornicle; H, tip of cornicle much enlarged; I, cauda; J, antenna; K, head; L, wing; and M, antennal hair, of winged viviparous female. Drawn from type slide 9919a in the collection of The United States National Museum.

### Myzus cynosbati Oestl.

As already stated the species described as *cynosbati* by the writer[5] is a different species. The accompanying figures (fig. 6, a–f) were made from the type slide through the kindness of O. W. Oestlund. The type slide is labeled "17 86" and bears dissected winged viviparous female. Antennal segment III bears 50 and 53 sensoria, respectively, (two antennæ on slide) irregularly placed the entire length of segment, segment IV 22–24 sensoria, V with 3 and the usual distal one. One of the wings on the slide is deformed, having the discoidal vein only once branched; the other wing with the second branch noticeably nearer apex than where first branches. Head mounted on side and view of tubercules not obtainable. Cornicles Myzus-like, imbricated at tip, slender and relatively short. Cauda also short as shown in figure 6e. Legs rather long. Sensilla of antennæ slightly swollen at tip but very inconspicuously so.

*Myzus cynosbati* we have collected on flowering currant (*Ribes aureum*) at Oak Park, Ill., June 23, 1909.

A species closely related which may prove a synonym of *cynosbati* was described by J. Troop as *Aphis houghtonensis*[6]. We have had the opportunity to examine the type slide of *houghtonensis* through the kindness of A. C. Baker. The types differ from the types of *cynosbati* by having fewer sensoria on segments III and IV of the winged female, having 25 to 28 on III and 2 to 7 on IV, while *cynosbati* has 50 to 53 on III and 22 to 24 on IV. Also the antennal sensilla are conspicuously knobbed in *houghtonensis* and only slightly so in *cynosbati*. (See figure 6, g to m). However, we have seen specimens sent us by R. H. Pettit collected on gooseberry which show all variations between the types of these two species. Further study and breeding work seems necessary to settle the question of synonymy in this case.

### Myzocallis alnifoliæ Fitch.

The species referred to by the writer under the name *Callipterus alni* Fabr.[7] should be *alnifoliæ* Fitch according to Baker's key[8].

### Saltusaphis elongata Baker.

The original description of this aphid was for the oviparous females only[9]. In the writer's collection is a slide of this species bearing a number of apterous viviparous females collected by J. G. Sanders on *Scirpus* sp. at Madison, Wis., July 13, 1912. It readily runs to *elongata* in Baker's key[10] and differs from the oviparous female only slightly as follows: Hind tibia not swollen nor bearing sensoria; antennal measurements, III, 1.34; IV, .65; V, .53; VI, base, .25; VI, filament, .42 mm., the total length noticeably more than that of the body.

5. Annals Ent. Soc. Amer., Vol. 2, 1919, p. 38.
6. Ent. News, Vol 17, No. 2, p. 59–60, 3 figs., Feb., 1906.
7. Jour. Econ. Ent., Vol. 3, p. 416, Oct., 1910.
8. Jour. Econ. Ent., Vol. 10, p. 423, Aug., 1917.
9. Can. Ent., Vol. 49, No. 1, p. 4, Jan., 1917.
10. Loc. cit., p. 2.

# NOTES ON ALLOGRAPTA FRACTA O. S. (DIPTERA: SYRPHIDAE).

*BY W. M. DAVIDSON, U. S. BUREAU OF ENTOMOLOGY, SACRAMENTO, CALIFORNIA.

During the spring and early summer of 1918 the writer was stationed in the Imperial Valley of southern California, and was afforded good opportunity to observe the habits of the predaceous fly, *Allograpta fracta* O.S.

Previous to the first settlement and cultivation, some twenty years ago, the Imperial Valley was a flat, almost treeless, dry plain and, therefore, was not a habitat congenial to Syrphidæ, a family most of whose members prefer moist forested localities. In 1918 with several hundred thousand acres under cultivation to grains, corn, alfalfa, cotton and grapes and with canals everywhere a fairly rich syrphid fauna might have been expected. This was not the case, and with three exceptions the writer failed to observe during five months' time other than aphidophagous types and some of these, the species of *Melanostoma*, abundant elsewhere in California were conspicuous by their absence. The three exceptions above mentioned consisted of the species *Mesograpta geminata* Say, *M. marginata* Say, and *Ceria* sp., the last-named breeding in wounds in the trunks and limbs of cottonwood (*Populus fremontii*). From February to July *Allograpta fracta* was without doubt the most abundant species present, and the larvæ were very beneficial, acting as an undoubted check upon the barley and corn aphis (*Aphis maidis* Fitch). So mild was the winter that numbers of adults were observed January 3rd, on the occasion of a visit to the valley. After the middle of February, when the writer took up his duties, until the end of June, when he left the valley, the adult flies were seen nearly every day, often in abundance, about barley and corn fields infested with aphids. The first larva was observed February 19th, and thereafter larvæ and pupæ were to be found at any time first on barley and later on corn. The larvæ were especially beneficial to barley from March 15th to April 30th, at which date most of the grain had ripened, and to corn during May and June. In some fields they were more abundant than in others, and in those in which they especially abounded it was found that about 25% of the infested heads had larvæ working on the aphids. Experiments on the number of aphids a larva could destroy indicated that one could in its life-time eat all the aphids on from three to four heads of grain of average infestation. It therefore appeared that if at any one time larvæ were found to be working in a quarter of the infested heads in a field they might be expected to wipe out in due course between 75% and 100% of the infestation of aphids. In one field of 20 acres examined on a number of occasions, it appeared that *A. fracta* was responsible for an almost total destruction of barley aphids.

Larvæ of *Eupodes volucris* O.S., *Syrphus americanus* Wied., *Allograpta obliqua* Say, and *Catabomba pyrastri* L. were present in the barley and corn fields, but in much smaller numbers than those of *Allograpta fracta*.

In the Los Angeles district of southern California *Allograpta obliqua* is very abundant and *A. fracta* comparatively scarce, whereas in the Imperial Valley the reverse evidently holds true. *Fracta* is common in the San Diego mountains.

In 1918 *fracta* was not bred from any other host than *Aphis maidis*, except that a single larva was taken attacking *Aphis pseudobrassicæ* Davis. *Aphis*

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October, 1919

*brassicæ* L., *Myzus persicæ* Sulzer and *Macrosiphum pisi* Kalt. colonies were searched frequently, but in vain, for larvæ and pupæ of the syrphid.

### Stages and Parasitism.

At El Centro 8 ova of *fracta* deposited March 22nd hatched 4 in two, 4 in three days, and two resultant larvæ pupated after a stage of 11 and 12 days; one individual emerged as an adult fly 8 days after it pupated. Six other individuals varied in the pupal stage from 5 to 12 days in April. From March 22 to April 30 the minimum daily temperatures ranged from 50 to 63 F., and the maximum from 71 to 96 F.; the average daily minimum was 58 F., and the average daily maximum 86 F.

Between the middle of February and the end of April 45 large larvæ and pupæ of *Allograpta* were collected in the field; of these 12 died in the pupal stage, 14 yielded mature *A. fracta*, 1 yielded mature *obliqua*, and 18 yielded parasites. From two of the parasitized puparia several imagoes of *Pachyneuron* issued, and from the other 16 puparia single Ichneumonid adults emerged. Most of the latter were *Eiplazon laetatorius* Fabr., adults of which were commonly observed flying about the fields. The puparia of the parasitized flies turned brown almost immediately after pupation. Within the puparia the parasites developed a little more slowly than the hosts.

## DESCRIPTIONS

The egg is white, microscopically sculptured, elongate oval, in length about .85 mm.; in diameter about .25 mm.; deposited by the parent beside a colony of aphids. Eggs observed on barley plants were all placed so that their long axis was aparallel to the long axis of the blade.

At birth the larva is nearly cylindrical, widest at the middle, whitish in colour, the mouth-parts gray. Each segment bears small, fleshy, conical elevations. The posterior respiratory tubes are short, not fused, and divergent; they are whitish, tipped with light brown. The transverse folds of the body are faint. After feeding the colour of the larva during the first instar becomes grayish white, the area about the dorsal vessel pink.

After the first moult the larva measures about 4.5 mm. in length, and 1 mm. in breadth. The green colour which persists until the pupa is about to give forth the imago is now obvious. Each of the fleshy conical elevations of the integument is surmounted by a short pale bristle. The posterior respiratory tubes become lengthened, basally fused mesad, divergent at the apices, twice as long as their combined basal width, pale green tipped with brown. For a few days after the first moult the pink dorsal stripe is apparent, gradually fading away. The fat bodies show through the integument as two narrow whitish stripes running longitudinally one down either side of the narrow dark dorsal vessel.

The full-grown larva is 8 to 9 mm. in length, 2 mm. wide, and about 1.2 mm. in height; elongate oval, somewhat flattened on dorsum, the anterior end drawn out to a point when the insect extends itself; integument finely papillose, transversely wrinkled, the fleshy conical elevations surmounted with pale spines, colour green, with two narrow whitish longitudinal stripes flanking the dorsal vessel, posterior respiratory tubes fused mesad, .5 mm. long, the combined base about .27 mm. wide. The structure of the stigmal plates is very similar to

that of the larva of *Allograpta obliqua* as shown by Metcalf (1)*, except that the anterior interspiracular spine beside the circular plate is much less prominent in *A. fracta* than in *A. obliqua*.

The larva pupates commonly on the plant surface, generally close by the place where it last fed. On blades of barley and corn the pupæ were almost always oriented parallel to the long axis of the blade.

The puparium is green; the two whitish larval stripes apparent for a day or two; as the true pupa inside takes on the black and yellow colour of the adult fly the colour of the puparium changes until all the green vanishes. The anterior face is bulbous, the outline of the dorsum convex, curving downward to the base of the posterior respiratory tubes, not concave anterad of the tubes, the venter is gently concave, sides narrowing posterad. Armature consists in the pale inconspicuous bristles of the larval integment. Length of puparium 5 to 6.5 mm., maximum breadth 2 to 2.3 mm., height 1.7 to 2.1 mm. (7 individuals).

**Adult Female.**

Oval. Vertex shining black, continued as a broad stripe to base of antennæ, thence as a narrow stripe to, or almost to, mouth cavity, face narrow, pale yellow or white, the light colour coming up on the sides almost to the ocelli, cheeks pale yellow, in front below the eyes a small brownish spot; pile of face short, pale yellow; pile of frons chiefly light-coloured, but some examples have considerable black pile in the middle; profile of face below antennæ gently concave to the base of tubercle; occipital pile silvery, above fulvous. Antennæ reddish yellow; third segment blackish or grayish along the upper edge, oval in shape, but little longer than wide in middle; arista brown, lighter basally.

Thorax shining metallic green, with short fulvous pile; a pale, yellow lateral stripe from humerus to suture, three yellow spots on the pleuræ; scutellum yellow, the extreme anterior corners black, pile light yellow except for a few black hairs on the disc. Wings hyaline, stigma brownish yellow. Legs yellow, posterior femora with a brown ring near apex, posterior tibiæ with brown rings at basal third and before the apex, hind tarsi reddish brown, last three joints brown; pile light-coloured.

Abdomen narrow, oval; first segment metallic black, anterior and lateral margins pale yellow, sometimes almost half the dorsal surface of the segment is yellow; remaining segments with shining black cross-bands, one on anterior, one on posterior margin, the central black part opaque; second segment with a slightly arched yellow cross-band, reaching the sides for its full width, about one-third as wide as the segment, constricted and sometimes interrupted in the centre, in some individuals continued up the sides to the anterior angles of the segment; third segment with a similar cross-band, wider and more conspicuously arched, not constricted, between one-third and one-half as wide as the segment; fourth and fifth segments with two median longitudinal, narrow, yellow stripes, and with two obliquely placed yellow spots, the latter on the fourth segment rarely coming in contact with the central stripes and reaching the lateral margins in their full width about apical fourth of the segment. Pile of abdomen short, except on the sides of the two basal segments; colour light yellow, on the disc black and yellow mixed.

*Figures in parenthesis refer to Literature Cited.

Length 6 to 7 mm.; length of wing 5 to 5.5 mm.

Described from 12 specimens taken in 1918 at El Centro and Alhambra, Cal.

Adult male (after Williston's quotation of Osten Sacken) (2).

". . . Length 7 mm. Face, including the frontal triangle, pale yellow, slightly opalescent; a bluish black stripe extends from the oral edge to the antennæ, forming a semicircle above them. Antennæ reddish, third segment brown along the upper edge, vertex black. Thorax bright metallic green, a pale yellow stripe on each side between the humerus and the root of the wings; ante-scutellar (post-alar) callosity yellowish; scutellum of a saturate yellow, the extreme corners dark; halteres with yellow knobs. First abdominal segment metallic greenish black, its extreme anterior margin only yellow; the rest of the abdomen black, opaque; an interrupted yellow cross-band on the second segment equal to about one-third the segment in breadth; a somewhat broader, slightly arched, and not interrupted yellow cross-band on the third segment; on the fourth, two narrow, parallel, longitudinal lines in the middle and an obliquely placed, large, oval spot on each side of them, yellow; the narrow fifth segment shows a yellow picture, somewhat resembling that of the fourth segment. Legs yellow; tip of tarsi brownish; hind femora with a brown ring before the tip; hind tibiæ with two such rings, one before the middle, the other before the tip; hind tarsi brown, except the under side of the first joint. Wings hyaline; stigma brownish yellow."

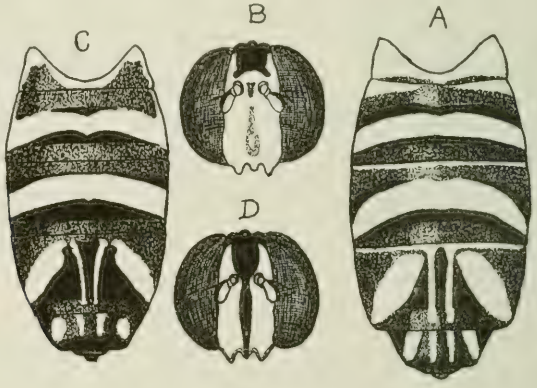


Fig. 31. A, B.—*Allograpta obliqua*, female, dorsum of abdomen and front view of head. C, D.—*Allograpta fracta*, female, dorsum of abdomen and front view of head.

Osten Sacken (3) described the species from a single male collected at Santa Monica, Cal., in 1876. There are before the writer 22 males from southern California; of these 20 have the cross-band of the second segment constricted in the middle and 2 have it interrupted, so that normally this band is not divided as in the type specimen. Also in these 22 males the coloration of the first abdominal segment varies as in the females, some having considerably more than the "extreme anterior margin only" yellow. In the males the cross-band of the third abdominal segment is on the average broader, and the oblique spots of the fourth segment larger than in the females.

Williston (2) indicated the differences between *Allograpta obliqua* and *A. fracta* to consist in the faint brownish facial stripe and yellow first abdominal

segment of the former as compared with the narrow, bluish-black facial stripe and blackish first abdominal segment of the latter.

In the writer's series of both species the facial stripe colour character holds good, although many *obliqua* specimens have the brown stripe hardly "faint" but quite prominent. In the *fracta* series no individual has as much as half the first abdominal segment yellow above, while in the *obliqua* series all specimens have considerably more than half the segment yellow, in fact only the posterior margin is black. The scutellar pile is a good character for separation; in *obliqua* it is all black, and in *fracta* almost all yellow. In both species the picture of the fourth segment is variable, but all the *fracta* females have the longitudinal stripes divergent anteriorly, while all the *obliqua* females have these parallel the whole length. This character does not hold for the males, owing to some of the *fracta* males having stripes not divergent.

*A. fracta* is a smaller species than *A. obliqua*. The immature stages are virtually indistinguishable.

The only known extra-Californian record for *A. fracta* is that of Metcalf (4) for Blowing Rock, N.C. This record suggests a transcontinental range for the species.

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(1) Metcalf, C. L. Syrphidæ of Maine. Me. Agr. Exp. Sta. Bull. 253, 1916, p. 234 and fig. 31.

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## OBITUARY.

### F. H. WOLLEY DOD.

On the 24th July, of enteric, at 49 Hospital, Chanak, Frederic Hova Wolley Dod, of Midnapore, Alberta, Sec. Lieut., Yorkshire Light Infantry, attached Macedonian Labour Corps.

Naturalists are born, not made, and if ever there was an enthusiast—a zealous seeker of scientific truths, it was our good friend who is gone. But to F. H. Wolley Dod even his beloved study of entomology had to take second place in his thoughts after the outbreak of war. He must go, and serve! and handicapped by his years, and his unfitness as a fighting man, he finally overcame all obstacles; obtained a commission; and served as a lieutenant in a Labour Battalion in Macedonia.

His last letter to me was joyous in the Allied victory, and full of plans for the future. "He must set up his Macedonian material, do a little collecting in England for old times sake; and then for Canada, and a trip into the mountains for alpine stuff. Would I go with him?" Aye, gladly would I go!

Dod was the pioneer worker in Alberta on the Ledpidoptera, with a special leaning to the Noctuidæ. For many years he contributed regularly to The Canadian Entomologist, the first of his long series of paper "Preliminary List of

the Macro-lepidoptera of Alberta" appearing in June, 1901. Five or six years ago he again went through his list, publishing additions and corrections. He also published papers in The Entomological News.

His great trait was thoroughness; and a bookcase of his notes on the type specimens, made on the occasions of his periodical visits to South Kensington, etc., not to mention his fine private collection, bear witness to his diligence. In the end he would take nothing for granted; and *believe nothing* unless substantiated by proofs. Nor can he be blamed for his incredulity when his own side of the case was told, viz., the confusion and added difficulties of his work in the early days, due to the snap judgments and incorrect identifications of the specialists of that time. So thoroughness begat real knowledge, and in the end he enjoyed an international reputation as an authority, if not the greatest authority, on the North American Noctuidæ.

A member of a well-known English family, and of excellent education, he loved his Alberta ranch at Midnapore next only to the Empire, and the science to which he devoted his lesiure hours for so many years.

As a scientist leaving an irreparable gap in the ranks, his death could be deplored, and as a friend I could find it in my heart to bitterly begrudge his loss. But neither of these would be worthy nor characteristic of the man—of the sacrifice he so gladly made, and the life he was so ready to give. He, I know, would have but one request to us all: "Continue the good work!"

F. C. W.

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Mr. W. Downes, Temporary Assistant at the Dominion Entomological Laboratory, Victoria, B.C., has been appointed a Junior Entomologist and will assist Mr. R. C. Treherne, Entomologist in charge for British Columbia, in the investigations on small fruit insects that are being conducted on Vancouver Island and the Lower Fraser Valley.

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Edmund H. Gibson has resigned his position with the U. S. Bureau of Entomology, and is entering upon a new field of endeavor for himself. Believing that entomology can be put on a dignified professional business basis the same as law, medicine, engineering, etc., he is taking the initial step, and believes that after a certain amount of pioneering work the field should open up to other entomologists. Mr. Gibson's headquarters, for the time being, will be Alexandria, Virginia. His professional card is worded "Consulting Entomologist and Agricultural Engineer."

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Mailed October 14th, 1919

# The Canadian Entomologist

VOL. LI. LONDON, NOVEMBER, 1919. No. 11

## POPULAR AND PRACTICAL ENTOMOLOGY.

### FURTHER REMARKS ON COLLEMBOLA.

BY CHARLES MACNAMARA, ARNPRIOR, ONTARIO.

A very remarkable feature of the Collembola is their amazingly wide distribution. They are found all over the world, and as Dr. Folsom remarks' "may be expected to occur wherever there is a soil that supports vegetation." The one condition fatal to them is dryness. Some of the scaled kinds are said to live in comparatively arid situations, but the vast majority can exist only in a decidedly moist atmosphere. Given a modicum of humidity, however, they can make themselves at home anywhere. You can collect them on cloud-capped mountains, under the dense shade of forests, over grassy plains, along the sea shore, or in your own wood-shed at home. They are perhaps most abundant among the moss, dead leaves, and rotten logs of woodlands, but they are common also in fields, gardens, and green-houses. They shelter under the bark of trees, (I have found them living at the top of a 75-ft. maple)—they are plentiful in long grass and damp soil, and certain over-ripe toadstools often swarm with them. They are counted among the unbidden guests in ants' nests, and one species is known in the United States as a household pest, though admittedly a very minor one. Many frequent caves,—some species occur nowhere else—others find their way deep down into mines, and one ghastly white Isotoma (*I. sepulcralis* Fols.) makes its hideous habitation with moulder-ing human bodies in the grave. Some occur along the sea shore, and may be submerged by the tide for hours every day without hurt. Others live on the banks of fresh-water streams, and many venture out on to the surface of ponds. A curious accident sometimes happens to these aquatic kinds. The "surface skin" of the water is for them a firm floor which they cannot break through, but occasionally an adventurer among them, by crawling down the stem of a water plant, penetrates beneath the surface. If he returns by the same road, good and well; but if he lets go of the plant, he at once floats up against the under side of the water film, and being as unable to break through from be-neath as he was from above, he perishes miserably.

Quite as remarkable as this "sub-ubiquity" of the order is the exceedingly wide range of certain genera and species. The name of the springtails common to the whole Northern Hemisphere is legion; indeed no other order of animals is known to show such a large proportion of Holarctic species. *Isotoma palustris* Mull., to mention only one, abundant on water in this country, is domiciled also in California, Great Britain and Siberia. Other species range even farther. *Sminthurus hortensis* Fitch, which you are sure to find in your garden in May and June if you look for it, is a resident also of Scotland, Bohemia, Japan and Tierra del Fuego. *Achorutes armatus* Nic., plentiful everywhere in our woods, is recorded from Greenland, Spitzbergen, Great Britain, Switzerland, North

Africa, Brazil and Chile, Ceylon, Sumatra, and New Zealand. I once heard a shantyman describing the camp he worked in as being in such an out of the way place in the woods, that even the chickadees had not discovered it. If this man's tastes had been entomological, he would certainly have found that he was not beyond the range of *A. armatus*. The genus Isotoma, however, holds the distributional record. It is not only known all over the globe from the shores of the Arctic Ocean to the remote islands of the Antarctic, but one of its species, *Isotoma klovstadi* Carpenter, shares the honour with another Collembolan, *Gomphiocephalus hodgsoni* Carpenter, of constituting the entire land fauna of the great Antarctic continent. Excluding as essentially pelagic the sea-birds that visit those desolate shores merely to nest, these two tiny and primitive insects are, so far as known, the only indigenous form of terrestrial animal life on Antarctica.

How these delicate, wingless insects have reached such widely separated stations is an interesting question. They are feeble and uncertain travellers, and their dispersal by their own efforts must be very slow. They have, of course, been transported to a certain extent by man along trade routes, but Dr. Folsom regards running water as the chief means of their spread over land areas, and some may be carried for limited distances by ocean currents along coasts and to outlying islands. But this does not explain how they have managed to cross vast ocean spaces and reach far distant and isolated archipelagoes in the Indian Ocean and the Pacific. Their presence in the nests of gulls and puffins on detached rocks on the coast of Ireland, as noticed by Carpenter, indicates the possibility of their transfer in some instances by birds. But the fact, also recorded by Carpenter, that they are plentiful on the ancient granite-formed islands of the Seychelles while nearly absent from the more recent coral islands of the same group, would suggest that their spread by birds must be both slow and limited in extent. It seems most probable that in some cases they have travelled to their present stations by land connections that have since disappeared. It is significant, too, that only the Arthropleona, the more primitive of the two sub-orders, have been found on the Seychelles and Hawaii. Apparently these islands were cut off from the rest of the world before the more specialized Symphypleona had been evolved. The Collembola are of an ancient race, and were old settlers in the world even in the inconceivably far-off days of those strange continents that geologists tell us existed where the oceans are now, and which they map out to the bewilderment of plain people who have been brought up on Mercator's Projection.

Heat and moisture, in some degree, are absolutely essential to all forms of life, vegetable or animal. The Collembola evidently regard moisture as a prime necessity, but many of them are not so particular about heat, and low temperatures affect them less than any other hexapod. This is shown by the habit of numerous species in coming out on the snow—a practice which has earned for them the popular name of "snow-fleas." Like most popular names, the designation is inaccurate, for the Collembola are not in any way related to the true fleas (Siphonaptera) and the species that come out on the snow occur in the summer also. But as the term is convenient to distinguish the insects in their snow-frequenting phase, its use persists.

A considerable number of arthropod sare recorded as having been taken on the snow, including mites and spiders and members of almost every order of insects. The occurrence of a good many of these creatures, however, is purely accidental and involuntary, and is due to their having been evicted in some way from their winter shelters. On the other hand, others come out regularly and with intent, or, if you prefer, as the result of some tropism. But with the doubtful exception of *Isotoma saltans* Ag., reported from the glaciers of the Swiss Alps, no hexapod, so far as I know, makes its permanent habitat on the snow. There are some microscopic rotifers and some curious worms (Oligochæta) that seem actually to live and breed in the snow of glaciers, but the snow-frequenting hexapods merely emerge from the soil and surface detritus for a few hours, more or less, and those that do not perish on or in the snow, eventually retire again to their subnivean shelters. In this class may be mentioned in addition to the Collembola, the Mecopter genus Boreus, and some of the stone-flies, (Plecoptera). I have seen thousands of the latter coming out of the Madawaska River at Arnprior about noon on a fine day in March, and all setting off southwards in obedience to a positive heliotropism that headed them straight into the sunlight. But the best known and most regular frequenters of the snow are certain species of Collembola.

The term "snow-flea" is sometimes used as if it designated a single species. Doubtless the title was first applied to *Achorutes socialis* Uzel, by far the most frequent and abundant species on the snow. But it is necessary nowadays to widen the application of the name; for at least eight genera of Collembola including more than thirty species, have been recorded as appearing on the snow in Europe and North America. Here again, however, we must distinguish between mere chance appearances and regular occurrences. Authors generally have paid little or no attention to this point, but there is no doubt that a good many springtail species appear on the snow, not in the course of a normal life activity, but as the result of an accident. Of the eleven species I have collected on the snow in the vicinity of Arnprior, four had obviously fallen out of logs or been washed from the ground by the running water of a thaw, and the individuals were either dead or numb with cold, although at the same time, the hardier species were quite active on the surface. But even allowing this, the Collembola have still a far larger number of snow species, both actual and proportional, than any other order of insects.

It is remarkable that practically all the snow habitués among the springtails belong to the more primitive of the two sub-orders; the Arthropleona. The only record I can find of a Symphypleona on the snow is given by Schött, who speaks of *Sminthurus aureus* Lubb. as having so occurred in Sweden. But while he mentions no date, the context of his statement leads to the suspicion that the snow fall was an unseasonably early one, and that the creatures were there by accident.

It is also worth noting that, so far as my observations go, none of the white or light-coloured species ever come out in the winter. The snow frequenters are of various shades of blues, browns, yellows, reds, greens and purples, but the colours are all so dark that nearly all the insects look virtually black on the snow. The celebrated Count Rumford, giving practical effect to his studies

in heat and light, dressed in white in the winter, on the principle that, as he was a warm-blooded animal, this costume would reduce to a minimum the radiation of heat from his body. Conversely, the snow-flea being a cold-blooded animal, with no bodily heat to lose, finds its dark pigmentation advantageous in assisting it to absorb heat when it comes to the surface in winter.

A great many species of Collembola survive the northern winter, but the snow-frequenting habit is sharply confined to certain kinds, while other closely allied species never emerge while the snow is on the ground. Available North American and European records credit about one-half of all the snow appearance, accidental or intentional, to the genus Isotoma. The other genera represented are Entomobrya, Achorutes, Onychiurus, Anurophorus, Orchesella, Tomocerus and Sminthurus. My experience in this district also is that Isotoma can claim more species on the snow than any other genus, *Isotoma nigra* MacG. is the most abundant of the genus here, and it is sometimes found over many acres of open woodland or beaver meadow, with a frequency of one or two specimens to the square yard. *I. palustris* Mull., more local in its distribution, often reaches about the same frequency in swampy places. *I. macnamarai* Fols., which affects wet places also, is scarcer, and it usually takes some searching to collect a dozen or so specimens. *I. viridis* Bourl. var. *riparia* Nic. I have found only towards spring. Once I collected 25 or 30 specimens in April on the snow covering a rather dry pasture, but mostly they are found sparingly in woods. A couple of other Isotomas of undetermined species are represented by only a specimen or two, and the appearance of one at least was accidental. Also a few odd specimens of *Tomocerus* sp., *Orchesella* sp. and *Entomobrya* sp. had evidently not come out of their own accord where I found them. Among the real snow travellers, however, we must class *Achorutes armatus* Nic. It never emerges in very large numbers, but I have found it active on the snow in the vicinity of small streams from November to March.

Very seldom do any of the species mentioned so far ever appear on the snow in sufficient numbers to attract the attention of the casual wayfarer; no one but the entomologist who is looking for them is likely to notice them. This does not mean, however, that the insects occur only sparingly, for many people are extraordinarily insensible to phenomena that do not affect them directly, and even when in large numbers, snow-fleas are often passed by unnoticed. One morning, crouched on my snowshoes in a narrow pathway through a cedar swamp, I was picking up Isotomas with a small brush and dropping them into a vial, when I heard another snowshoer come crunching over the crust towards me. It was a labouring man of my acquaintance with his axe on his shoulder, taking a short cut to his work across the Ottawa River. He gave me a polite "good-day," but looked so curiously at my occupation, that in order to preserve at least the remnant of a reputation for sanity, I thought it well to explain to him what I was doing. He was greatly surprised to see the insects on the snow. They were plentiful that morning, and for some distance he had been crushing scores of them under his snowshoes at every step, but he had not noticed them until I pointed them out to him. "Well, by gosh!" he said, "I often heard tell of snow-fleas, but I never seen them before." A worthy man as I know, though imperfectly instructed in grammar.

But the most heedless passer-by cannot overlook *Achorutes socialis* Uzel when it makes up its mind to come out. The vast swarms literally blacken square yards of the snow around the principal foci from which they emerge. On level surfaces they may be as thick as 500 to the square foot, while in hollows and depressions in the snow—such as foot-prints—from which they cannot easily escape, they sometimes accumulate in solid masses that could be ladled out with a spoon. (I find the mark of a No. II shoe-pack an admirable snow-flea trap,—and to prevent unkind inferences I hasten to point out that in winter this footwear calls for at least four pairs of heavy socks.) Spreading out from these centres, the distribution becomes thinner, though for acres the insects often run from 10 to 50 to the square foot, and examination of a yard or so of the surface anywhere over miles of country is almost certain to show two or three specimens leaping and clambering among the snow particles.

Most writers speak of snow-fleas as occurring in the spring, and it is true that some species of them seem to come out only at that season, and in general they are most abundant towards the end of the winter. But it is the effect of the mild weather whenever it occurs and not the season that brings them out, for most of them can be found on the snow every month from November to April whenever the rising temperature approaches the freezing point. Those excellent field-naturalists, the Red Indians, noticed this. Among the native weather lore recorded by F. W. Waugh in his "Iroquois Foods," the snow-fleas are said to indicate mild weather, and the Onondagas, Mr. Waugh says, called them "soft weather fleas."

But it should be borne in mind that while the snow-flea tide rises in direct relation with the temperature, the soft weather is not the determining cause of the insects' emergence. The real factor is the amount of moisture in the atmosphere. In mild weather, the large quantity of water vapor released by the melting snow soon brings the humidity, both relative and absolute, to a high figure, and the snow-fleas, finding a more

(To be continued.)

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## NEW APHIDS FROM OAKS.

*BY W. M. DAVIDSON, U. S. BUREAU OF ENTOMOLOGY, SACRAMENTO, CALIFORNIA.

**Vacuna californica,** sp. nov.

*Vacuna dryophila* Schrank?. Davidson, Journal Econ. Ent., Vol. X, Apr., 1917.

In April, 1917, issue of the Journal of Economic Entomology, the writer referred this species doubtfully to *dryophila* Schrank of Europe, only a single winged individual having been taken up to the time the article (Little-known Western Plant-Lice II) was submitted for publication. Since that time more winged insects have been collected, and all prove to differ from the typical *dryophila* in the same manner as the first. It appears, therefore, that the Californian insect is worthy of specific rank.

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November, 1919

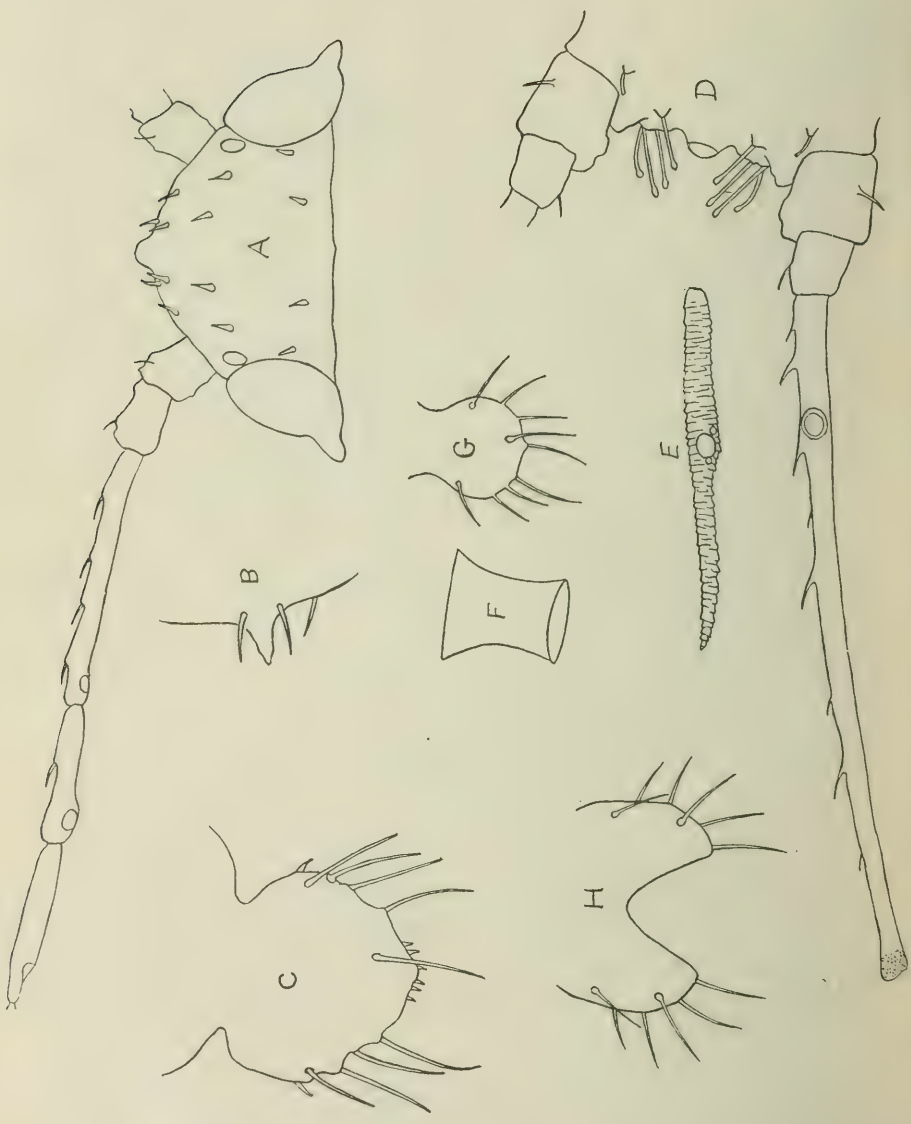


Fig. 32.—A-C, *Vacuna californica*, sp. nov.; A, head and left antenna; B, lateral tubercle of abdomen; C, cauda from above. D-H, *Myzocallis quercifolii*, sp. nov.; D, head and left antenna (joints I to III); E, joint VI of antenna; F, cornicle; G, cauda from above; H, anal plate from above.

The two species differ as follows:—

| *V. dryophila* | *V. californica* |
|---|---|
| 4 or 5 sensoria on antennal III. | Only the apical sensorium on antennal III. |
| About 9 long hairs on antennal III. | 3 or 4 long hairs on antennal III. |
| Mesothorax appearing as single chitin plate. | Mesothorax appearing as partially divided into lobes. |

Dates of collection of winged forms are as follows: May 16, 1915; April 29, 1916; May 8, 1916; *Quercus lobata* Nee, Walnut Creek, Cal., May 14, 1917; *Quercus macrocarpa* Michx., Sacramento, Cal.

**Myzocallis quercifolii,** sp. nov.

*Alate viviparous female.*

General colour light green; antennæ pale green with narrow brown annulations at apices of joints, filament of joint VI brownish; head and thoracic lobes olive green; wings hyaline, stigma very pale with dusky brown spots at base and apex; legs pale green, base of tibiæ with a brown ring, femora brownish near apex, tarsi and tibial apices brown; tubercles of thorax and abdomen paler than body colour; cornicles pale green; cauda and anal plate pale green; beak pale, extreme tip brown; venter light green.

Antennæ on short frontal tubercles, slender, longer than body, base and filament of joint VI subequal; joint III with one or two circular sensoria near the base; antennal spines rather stout; the forehead bears 8 stout prominent pale capitate spines, in length equal to half the width of the forehead. Prothorax and mesothorax each with a pair of tubercles on the dorsum. Abdomen narrow, with three pairs of conical tubercles on the dorsum and with three pairs of blunt tubercles on sides. Cornicles slightly longer than wide at base, somewhat constricted in centre. Cauda globular, spinose. Anal plate deeply cleft, spinose. Beak reaches to the second coxæ. Wings longer than body.

Measurements.—Length of body (mounted specimens) about 1.25 mm. Width of body about .45 mm. Antennæ, joint lengths: III .61 mm., IV .35 mm., V .32 mm., VI .28 mm. (.145 mm. plus .135 mm.). Length of wing 1.94 mm., of cornicles .085 mm., of cauda .08 mm., of beak .23 mm., of hind tibia 1.06 mm.

Described from 3 individuals collected on the leaves of Blue Oak (*Quercus douglasii* H. & A.) by Mr. F. B. Herbert, Los Gatos, Cal., June 4, 1917.

This species is closely related to *Myzocallis quercus* Kaltenbach, *M. pasaniæ* Davidson, *M. californicus* Baker, and *M. californicus* Baker var. *pallidus*, below described. The prominent capitate spines on the forehead will distinguish it from others.

The following key will separate the above species:

1. Cornicles partly black..... *Myzocallis quercus* Kalt.
   Cornicles pale throughout..... 2.
2. Forehead of winged vivipara with prominent capitate spines..... *Myzocallis quercifolii,* sp. nov.
   Forehead of winged vivipara with spines non-capitate or indistinctly capitate..... 3.

3. Distal antennal joint about .58 mm. in length.....*Myzocallis pasaniæ* Davidson.
   Distal antennal joint about .34 mm. in length.....4.
4. Distal sensorium of antennal III at or beyond middle of joint.....*Myzocallis californicus* Baker.
   Distal sensorium of antennal III hardly one-third of the length of the joint from base.....*Myzocallis californicus* Baker var *pallidus* var nov.

**Myzocallis californicus** Baker var. **pallidus** var. nov.

This form differs from var *californicus* in the sensoriation of the third antennal joint, *pallidus* having 3 or 4 sensoria all in the basal third of the joint, whereas *californicus* has from 4 to 6 sensoria more widely distributed and occupying the basal half or more of the joint The structure of the body including the dorsal tubercles is very similar

Var *pallidus* is pale green in colour, smaller in body than *californicus;* it was collected January 5, 1918, on *Quercus dumosa* Nutt , an evergreen scrub oak, near Jacumba, Cal.

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## A NEW SPECIES OF THE GENUS TACHYDROMIA FROM ILLINOIS (DIPTERA, EMPIDIDÆ).

BY J. R. MALLOCH, URBANA, ILL.

The type series of the species described herein is deposited in the collection of the Illinois State Natural History Survey.

**Tachydromia harti,** sp. n.

Male and female.—Glossy dark brown. Head black; antennæ yellowish testaceous; palpi brown. Thorax brown, paler anteriorly; propleura with white pruinescence. Abdomen yellowish at base of venter. Legs yellowish testaceous, darker in female, hind femora and tibiæ except bases, mid tibiæ at bases, and apices of basal three and all of apical two joints of all tarsi in both sexes blackened; fore tibia in male with two deep black spots on the inner or anterior side, one, heart-shaped, beyond middle and the other, round, at apex. Wing with two broad, black fasciæ as in *schwarzi* Coquillett, but the apical fascia extending nearer to apex of wing. Knobs of halteres white.

Eyes distinctly separated in both sexes; third antennal joint not large than second; arista terminal. Dorsum of thorax nude; scutellum with two bristles. Ventral sclerite of abdomen in male in front of hypopygium with a number of curved bristles, apex of hypopygium with a few similar bristles. Fore femur much swollen; fore tibia of male very much dilated from base to apex. Venation as in *schwarzi.*

Length 1.5–2 mm.

Type—male, Havana, Ill., June 5, 1918, (J. R. Malloch). Allotype and paratypes topotypical. One male and three females.

This species is most closely allied to *schwarzi* Coquillett, but may be separated from it by the broadened fore tibia of the male and the very much closer approximation of the subapical fascia to the apex of the wing.

Named in honour of my late colleague, C. A. Hart, who did some of his best work in the locality where the species was taken.

# NOTES ON COCCIDÆ—IV. (HEMIPTERA).*

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

In an earlier paper of this series I called attention to the artificial character of the genus *Sphaerococcus*, and began the process of transferring the included species to other genera. At that time specimens of the genotype, *S. casuarinæ* Maskell, were not available for examination, but since then (through the kindness of Professor Cockerell) I have been enabled to see specimens of this species. The suspicion that I then expressed to the effect that this species is merely an *Antonina* is nearly, if not quite, substantiated, for it is certainly of this type. However, there are certain points upon which the genus *Sphaerococcus* may, for the present, be maintained.

I am here redefining the genus. Also, I am removing from this genus three more species, one of which, *S. obscuratus* Maskell, I refer provisionally to the genus *Kuwanina*, another, *S. leptospermi* Maskell, which I refer to the genus *Amorphococcus*, and another, *S. pirogallis* Maskell, for which I name a new genus, *Eremococcus*. I may note here that *Sphaerococcus sylvestris* Ckll. and King, is probably nothing more than an immature stage of some species of *Kermes*.

## Genus Sphaerococcus (Maskell).

Coccidæ referable to the subfamily Dactylopiinæ (of the Fernald Catalogue) and belonging to the *Pseudococcus* group, that is, possessing dorsal ostioles. Adult female resembling the female of *Antonina;* apodous; with the antennæ reduced to mere vestiges of three or four minute segments; with the posterior end of the abdomen invaginated to form a short tube at the inner end of which is the anal ring, this bearing six short setæ. Differing from *Antonina* (if at all) only in the fact that the legs are present in the penultimate stage of the female. First stage larva with six-segmented antennæ, with six hairs on the anal ring, with dorsal ostioles.

Type of the genus, *Sphaerococcus casuarinæ* Maskell. It is probable that none of the other species now referred to this genus are congeneric with the geno-type.

*Notes.*—As I have pointed out in the description given above, this is essentially an *Antonina*, differing only in the fact that the legs are retained in the penultimate stage. However, this point needs investigation. I would call attention to the fact that in one species now referred to *Antonina* (*A. parrotti* Ckll.) the anterior pair of legs alone are retained in what has been described as the adult. In specimens of *A. indica* Green, the legs are lacking in the penultimate stage.

### **Sphaerococcus casuarinae** (Maskell).

Fig. 33.

There is little except detail to add to the description given by Maskell. The species resembles the various species of *Antonina* except that it is more nearly circular. The anal ring bears six short setæ and is not hairless, as asserted by Maskell. Beyond this the material examined does not permit me to go.

*Continued from Canadian Entomologist, vol. 50, p. 113, (1919).

The first stage larva is quite as in *Antonina*. The antennæ are six-segmented. The anal lobes (Fig. 33) bear a single stout spine, a short seta and the usual long seta.

*Material examined.* From *Casuarina quadrivalvis*, Australia.

Genus AMORPHOCOCCUS Green.

But two species are at present referred to this genus, one *A. mesuæ* Green, from Ceylon and another *A. acaciæ* Brain, from South Africa. With these

Fig. 33.—*Sphaerococcus casuarinæ* (Maskell); dorsal aspect of portion of caudal extremity of first larval stage.

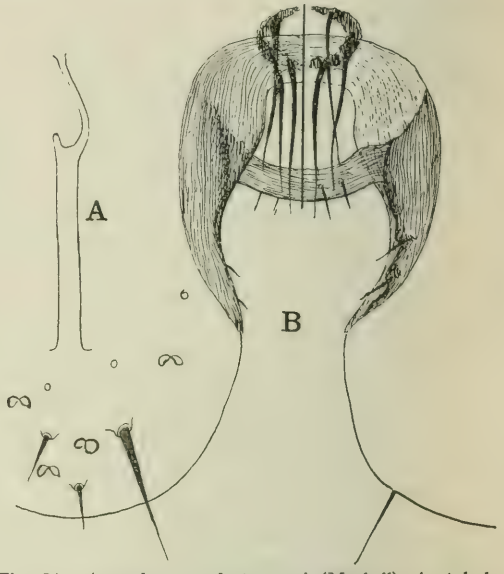


Fig. 34.—*Amorphococcus leptospermi* (Maskell); A, tubular duct; B, anal rings and surrounding structures, left half dorsal, right half ventral.

*Sphaerococcus leptospermi* Maskell appears to be strictly congeneric. All are gall makers, the galls appearing as twig swellings.

**Amorphococcus leptospermi**, (Maskell).

Fig. 34.

*Habit.*—Occurring in a twig gall, this gall being merely a swelling with a small, pore-like opening at the top.

*Morphological characteristics.*—Adult female apodous and with the antennæ reduced to mere vestiges, which show three or four minute segments. Derm membranous throughout. Pores of the 8-shaped type small and rather few, scattered over the body but most numerous in a narrow zone extending about the lateral margin of the body. Tubular ducts likewise relatively few, of the type shown in Fig. 34A. Anal lobes rather prominent, each bearing one moderately long and two much shorter setæ. Anal ring borne at the inner end of a quite deep cleft, apparently at the end of a short invagination, rather small, bearing six slender setæ. The mouth of the invagination (Fig. 34B) is surrounded by a narrow chitinous ring. From this ring a chitinized area extends posteriorly along each side of the cleft.

Immature stages not seen.

*Material Examined.*—Specimens from *Leptospermun* sp., Australia, determined by Froggatt at this species and agreeing in general with the original description.

*Notes.*—Assuming this determination to be correct (as it doubtless is) the original description is in error in the statement that the anal ring is hairless. Also the original description hints at the presence of abdominal spiracles, which are certainly lacking.

This species appears to differ from *A. mesuæ* and *A. acaciæ* in the much deeper anal cleft and the form of the chitinized areas about the anal opening.

Genus KUWANINA Cockerell.

**Kuwanina obscurata** (Maskell).

Fig. 35.

*Habit.*—Occurring in galls which are mere swellings of the bark.

*Morphological characteristics.*—Adult female (Fig. 3A) apodous and with the antennæ reduced to mere vestiges with three or four minute segments. Form broadly oval or subcircular. Derm everywhere heavily chitinized. Anal opening appearing on the ventral side, small, heavily chitinized and only slightly cellular, bearing six very small spines. The opening is covered by a small, cauda-like flap. Constrictions between the abdominal segments very

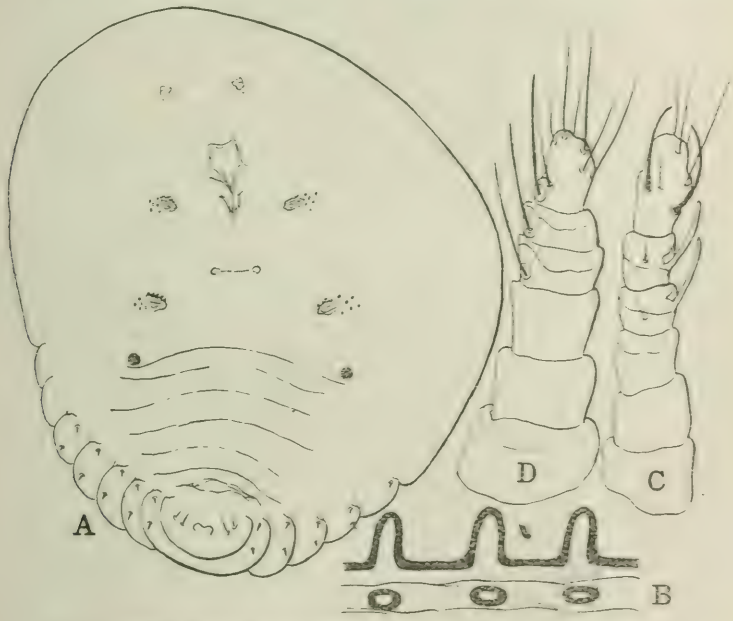


Fig. 35.—*Kuwanina obscurata* (Maskell); A, adult female, venteral aspect; B, pore-like structures of the intersegmental furrows; C, antenna of first stage; D, antenna of penultimate stage.

deep on the dorsal side and extending somewhat to the ventral side. In these constrictions there appear numerous pore-like openings which communicate with invaginations of the derm (Fig. 35B). These invaginations show no evidence of internal pores and are, therefore, hardly to be described as ducts. They are confined to the intersegmental furrows of the abdomen and are most numerous toward the posterior end, forming a continuous, transverse row on the last

four or five segments. Anterior to these segments they appear only toward the lateral margins. Abdomen with a few rather stout, conical spines arranged in transverse rows. Spiracles not unusually large, associated with a few very small, circular pores. Behind each of the posterior pair there is a small, cribriform plate or tubercle.

*Penultimate stage.*—In form resembling the adult but without the constrictions between the abdominal segments, without the pores in the intersegmental furrows and less heavily chitinized. Antennæ and legs present, the former (Fig. 35C) quite stout, six-segmented, the latter of ordinary character, the tibia somewhat shorter than the tarsus, the claw with a small tooth. Anal ring as in adult but at the tip of the abdomen. Body with a few, scattered conical spines and a very few, small, multilocular pores.

*First Stage.*—Antennæ (Fig. 35D) six-segmented, the last three segments each with one or two long, stout, curved spines. Anal ring with six slender setæ. Anal lobes each with a single slender seta and two short spines. Derm with a few small, stout spines and multilocular pores.

*Specimens examined.*—From *Eucalyptus*, New South Wales, Australia. Collected by Koebele and received by me from Mr. Ehrhorn. They agree in all respects with the original description.

*Notes.*—While it is possible that this species is not strictly congeneric with *K. parvus*, I am inclined to think that it belongs in the group with that species. It will at least rest better in *Kuwanina* than in *Sphaerococcus*. It differs from *K. parvus* in the nature of the first stage and in the entire absence of the tubular ducts which are a conspicuous feature of *K. parvus*, while it agrees in the presence of the pair of cribriform plates or tubercles behind the posterior spiracles.

Genus EREMOCOCCUS, new genus.

Coccidæ referable to the subfamily Dactylopiinæ (of the Fernald Catalogue) but of doubtful position within this group. Adult female apodous and with the antennæ reduced to mere unsegmented vestiges; anal orifice simple, minute, borne on the dorsum; dorsum of adult flat, heavily chitinous, venter membranous; mouth-parts with internal framework unusually large and heavily chitinized; first stage larva with anal ring small and simple as in adult, with the antennæ composed of a single very large segment (and possibly one or two minute basal segments), with the anal lobes obsolete and not marked by a long seta. Dorsal ostioles lacking; tubular ducts lacking.

Type of the genus, *Sphaerococcus pirogallis* Maskell.

*Notes.*—I am unable to throw any light on the relationships of this genus. I would suggest that possibly its nearest relatives are to be sought for in such forms as *Sphaerococcopsis* and *Pseudoripersia*.

**Eremococcus pirogallis** (Maskell).

Fig. 36.

*Habit.*—Enclosed within a small, pear-shaped gall which has a minute opening at one side near the base. The insect lies in a saucer-like elevation at the far end of the gall.

*Morphological characteristics.*—In addition to the characters given in the description of the genus I may add the following. The female of the early adult stage is entirely membranous but at maturity the dorsum becomes heavily

chitinized and the venter becomes much expanded (Fig. 36A). This dorsal, chitinized area is destitute of spines and pores except around its margin where there are numerous slender setæ and pores of the type shown in (Fig. 36B). There are also numerous setæ about the vaginal orifice. The antennæ (or what appear to be the antennæ) are a pair of small, tubular, wrinkled, chitinous structures, usually appearing behind the mouth-parts and presenting no traces of segmentation. The internal framework of the mouth-parts in unusually

Fig. 36.—*Eremococcus pirogallis* (Maskell); A, adult female, from dorsal aspect; B, type of pore.

large, and the rostrum is borne upon a prominence, the derm of which presents a somewhat papillate appearance. I have been unable to detect any trace of tubular ducts.

The first stage larva is as described under the genus. My material is not in sufficiently good condition to permit the presentation of figures.

*Material examined.*—Specimens from Froggatt and from Ehrhorn, determined as this species and agreeing with the original description.

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## WILSONIA—A CORRECTION.

A curious case of lapse of memory occurs in my article, Canadian Entomologist, Vol. LI, p. 212. Although I know several species of *Wilsonia* I used this name for a genus of Aphids. Both Dr. Cockerell and Mr. Criddle have called my attention to it. It is inexcusable. I herewith substitute the name *Dilachnus.*

A. C. Baker.

## A NEW OAK GALL FROM ARIZONA. (HYMEN., CYNIPIDÆ).

BY LEWIS H. WELD, EVANSTON, ILL.

**Andricus splendens,** n. sp.

*Female.*—Head a clear, dark red, finely shagreened, with whitish hairs on lower face and cheeks, slightly broadened behind the eyes, concave behind. Eyes black, bare, coarsely granulate. Antennæ 14-segmented, the third and fourth slender and equal, the last slightly longer than the next to last, distal half darker. Palpi 5- and 3-segmented. Mesonotum reddish with a median black area enclosing the two anterior parallel lines and a smooth, black area over base of each wing (but sometimes almost uniformly infuscated). It is one and a half times as long as the width of the head, its surface finely coriaceous (best seen in balsam mount) with scattered punctures bearing short whitish hairs. Scutellum is rugose behind with setigerous punctures, has a mediodorsal smoothish area behind the two distinct black polished shallow pits and a steep triangular impression on each side. Mesopleuræ polished, bare except for pubescent area above. Legs lighter in colour, yellowish, with middle and hind coxæ infuscated, hind femur normal, tarsal claws small but in balsam showing a distinct tooth. Wings hyaline with distinct brown veins, surface short brown pubescent and margin short ciliate. Median segment with two distinct outwardly curved ridges enclosing a smooth area which is narrowed at the top. Abdomen darker, smooth and polished, not compressed, as deep as long and with a pubescent area on each side at base. Ventral spine about three times as long as broad, slightly pubescent. Ovipositor (when dissected out) a little longer than length of antenna, eggs well developed, nearly globular with long pedicel. Using the width of head in widest part in balsam mount as a base the length of wing ratio is 4.61-4.78; length of antenna ratio 2.75-2.93; length of ovipositor 2.71–3.00.

Range in length of 350 dry specimens measured by optical methods to nearest tenth of a millimeter was 1.3–2.4mm. Other constants for the group were calculated. Mode 1.950 mm. Mean 1.926–0.007. Median 1.933–0.008. Standard deviation 0.181–0.005. Coefficient of variability 9.40%–0.24%. Average deviation from median 0.147 mm. Quartile deviation 0.127 mm.

Described from two balsam slides, 84 pinned specimens and others in vial dry.

Type and paratypes in U. S. N. M. Type No. 22328. Paratypes deposited also in N. Y. State, American, Cornell, Field and Harvard Museums, and with Wm. Beutenmuller and author.

Related to *Andricus rileyi* Ashm. (to which it runs in the Dalla Torre and Kieffer key in Das Tierreich) which is a larger species from east of the Rockies without a tooth on tarsal claw.

*Type Locality.*—Prescott, Ariz.

*Host.—Quercus grisea* Lieb.

*Gall.*—Single or scattered on the under side of leaf. Cylindrical with ends and middle slightly swollen, 2 mm. in diameter and 3–5 mm. high, covered with short stout blunt spines from which run faint decurrent ridges. Sessile, often lop-sided, spines more numerous on basal third. The rosy red colour with a straw yellow band around the middle and some yellow at either end, together

with its crystalline appearance make it a very beautiful object and suggest the name. The basal third is solid, then comes the thin-walled larval cell in the middle of the gall leaving the distal third or more tubular with the open end slightly flaring. The exit hole is made into the hollow portion. The gall was figured by Dr.E.P. Felt in his paper on "Gall Insects in their Relation to Plants" in Sci.Mo. 6:515, Fig. g (June,1918), and again in the Ottawa Naturalist 32:130, Fig. g, and was also characterized by him under the above manuscript name in his "Key to Am. Insect Galls" in Bull. N. Y. State Mus. 200:106.

*Habitat.*—The species was first brought to my attention by three specimens sent by Dr. Felt, collected by Messrs. Bethel and Hedgcock two miles S.W. of Prescott, Ariz., in the fall of 1917. These were cut open on Dec. 5, 1917, and gave three living adults, one of which was selected as the type. On Apr. 11, 1918, while collecting for the U. S. Bureau of Entomology, Division of Forest Insects, I took galls near Williams, Ariz., on a hillside N.W. of Supai siding, and flies began to emerge before Apr. 16. On Apr. 13, 1918, a lot more were taken near Prescott, and flies emerged by Apr. 20 and continued to come out until the last of May. The larvæ evidently transform to adults in the fall but remain in the galls all winter and emerge the next spring. An alternating sexual generation produced in an early summer gall is suspected but not known.

The U. S. National Museum possesses galls of this species, found on an unknown oak from Durengo, Mexico.

## CATORAMA NIGRITULUM Lec.,[1] AND ITS FUNGUS HOST.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

This member of the family Ptinidæ was recently found at Springfield and Monmouth Junction, N.J., breeding in the sporophore or fruiting body of *Fomes applanatus*.[2] Smith[3] records it only from Woodbury, July 7 (Brn.) and Blatchley[4] states that it is scarce in Vermillion and Lawrence counties, Indiana, May 24–June 13. Fall in his "Revision of the Ptinidæ of Boreal America"[5] records it as occurring in Mass., D.C., Va., W. Va., Ohio, Mich., Tenn., Miss., Indian Territory and Texas, and writes as follows about the genus Catorama,—"very little is known as yet concerning the life-habits of the species of this genus. Certain species are known to inhabit galls while others have been found in the seeds or stems of various plants."

At Springfield, N.J., on April 8, several specimens of the beetle were taken from the fungus *Fomes applanatus*. More than a month later, or on May 30, numerous adults, several pupæ and many larvæ of all sizes were found in another specimen of the same fungus at Monmouth Junction, N.J. Both the context and tubes of the fungus were bored by the insects, but most of the feeding appeared to have taken place in the tubes. The pupal cells also were found in the tubes.

*Fomes applanatus* (Pers.) Wallr., occurs on old logs and stumps of deciduous trees in various parts of New Jersey. Overholts in his "Polyporaceæ

1. Kindly identified by Mr. C. W. Leng.
2. Kindly identified by Mr. Erdman West.
3. Insects of New Jersey, N. J. State Museum Report, 1909, p. 307.
4. Coleoptera of Indiana, p. 880.
5. Tr. Am. Ent. Soc., XXXI, 1905, p. 97–296.

of the Middle-Western States"[6] records it from Mich., Ohio, Ky., Ind., Ill., Wis., Minn., Iowa, Mo., Kan., Neb., N. Dak. Heald[7] describes a disease of the cottonwood due to *Fomes applanatus*, but Von Schrenk and Spaulding[8] consider it as a saprophytic form.

*Full-grown larva.*—Length 2.5 mm. to 3 mm. Width 1 mm. Colour whitish or dirty white; body soft, curved, resembling a miniature white-grub, strongly convex above and flattened beneath, skin transversely wrinkled. Head whitish, mouth-parts dark. Body and head sparsely hairy. Median dorsal surface of thoracic segments elevated into a distinct ridge. This ridge not as pronounced in immature larvæ. Dorsal portion of abdominal segments supplied with transverse group of minute stiff hairs or spines. Fewer similar spines on dorsal surfaces of thoracic segments. Legs short and weak.

*Pupa.*—Length 2.2 mm. Width 1.4 mm. Suboval, white or yellowish white, smooth. Posterior end prolonged into a somewhat flattened blunt process armed at each posterior, lateral edge with a transverse leg-like appendage, each appendage terminated by a chitinous hook.

*Adult.—Catorama nigritulum* Lec., (Proc. Phil. Acad. Nat. Sci., 1865, 241). The following description is by Blatchley. "Elongate-oval, moderately robust, less than twice as long as wide, not narrowed behind. Black or piceous; pubescence sparse and very fine. Head and thorax finely, closely and evenly punctulate without intermixed coarser punctures. Elytra finely punctulate with scattered larger punctures. Eighth antennal joint broadly triangular. Length 1.7–2.4 mm."

## A NEW SPECIES OF PHORIDÆ FROM ILLINOIS (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

The species described herein was taken by me in 1918, and the type is deposited in the collection of the Illinois State Natural History Survey.

**Beckerina luteola,** sp. n.

Female.—Testaceous yellow, shining; third antennal joint orange yellow; frons brownish; dorsum of thorax with 3 faint reddish vittæ; pleura with a small, dark spot below base of wing; dorsum of abdomen except the anterior and posterior margins of each segment brown; apices of hind femora infuscated; wings clear, veins pale brown; halteres yellow.

Frons about 1.5 as broad as long, the surface with sparse, erect setulæ in addition to the strong bristles; preocellar series of bristles almost straight, second series following contour of anterior margin of frons, slightly curved; postantennals two in number, divergent, erect, moderately strong; third antennal joint rounded, about one-fourth as large as eye; arista longer than width of frons, pubescent; palpus larger than third antennal joint, with a few bristles along lower margin; proboscis short, stout, fleshy. Dorsum of thorax with dense, short, pale hairs; scutellum much broader than long, with two bristles; mesopleura bare. Abdomen with a few weak bristles on lateral margins of second and third dorsal segments. Legs stout; fore tarsi slender; all tibiæ

6. Wash. Univ. Studies, Vol. III, Part 1, No. 1.
7. Nebr. Agr. Sta. Rept. 19; p. 92–100, 1906.
8. U. S. Bur. Plant Industry, Bul. 149, p. 58.

rounded, without dorsal setulæ. Costa extending nearly to middle of wing, noticeably thickened from near base to apex, the setulæ rather close, not much longer than diameter of costa, first section slightly longer than 2+3, third about half as long as second; fourth vein arcuate, ending well in front of apex of wing; all thin veins evanescent at apices.

Length 2.25 mm.

Type.—Cobden, Ill., May 9, 1918. One specimen.

This species differs from the only described North American one, *orphnephiloides* Malloch, in being yellow instead of black, in the armature of the frons, and the much shorter costal vein.

## A BUTTERFLY NEW TO KANSAS.

BY HORACE GUNTHROP, WASHBURN COLLEGE, TOPEKA, KANS.

The capture of a specimen of *Eresai texana* Edwards in the city of Topeka by Prof. W. A. Harshbarger on October 24, 1918, adds a new species to the list of Kansas butterflies. The specimen, a female, was caught on a hedge on West Sixth St., near the city limits.

According to Holland*, this species ranges from Texas into Mexico, so its presence as far north as Kansas must be looked upon as accidental rather than as an extension of its normal range. It is probable that the chrysalis was carried here upon some shipment of goods on the railroad, or by some other human agency.

## PISCATORIAL ENTOMOLOGY.

Entomologists not familiar with the classification of insects more or less current among fly fishermen, may be interested in a brief review of the subject based chiefly on an American book. The classification rests essentially upon the works of various English fly-fishermen but has been applied to American insects, worked out and illustrated in the book to which we refer, namely, "American Trout-Stream Insects," by Louis Rhead (1916).

The names for insects orders which differ most from those in ordinary use among entomologists are: drakes for the may-flies, browns for the stone-flies, duns for the caddis-flies, and spinners for the crane-flies. The nomenclature of species is more or less fanciful, for instance: brown buzz, nobby spinner, yellow sally, black dose. However, names of this sort cannot be entirely ignored by entomologists for among them are some genuine vernacular terms, viz., redbug for *Aphodius fimetarius* in the Catskill region of New York. Since common names for insects are so rare, yet desirable, all those actually in use should be noted.

Fishermen are not to be severely criticized for inventing a classification and nomenclature especially adapted to their special needs, but it should rest upon accurate observation, and reasons urged for adopting it should be the real and perhaps justifiable ones, honestly stated, not unfounded allegations regarding the lack or unreliability of scientific system.

*W. J. Holland. The Butterfly Book. New York, 1904.

The author here reviewed commits all these errors, and his book would have been better without them. As examples of mistakes in observation, we may point out the following: April Insect Chart., Fig. 1. The figure is said to represent one of the Trichoptera, which it illustrates with a caudal appendage having two pairs of branches, something no North American insect of any order has. May Insect Chart, Fig. 14. A crane-fly is drawn with netted venation a character which the artist should have restricted to his browns, duns and drakes, August Insect Chart, Fig. 14. This "fluffy spinner," said to be one of the Diptera, but is drawn with only four legs (all insects having six). The original of this sketch probably was a *Pterophorid* moth. The author speaks a number of times of his faithful representations of the insects and especially of getting the colours true, but to those accustomed to good entomological illustrations, these are crude, and the colours, as reproduced unsatisfactory.

Now, as to reasons for not adopting the classification of scientists Mr. Rhead says: "European entomologists have divided insects into various orders; each season finds them making new classifications so conflicting as to bewilder the lay mind," (p. XVII). Taxonomy has had to bear many reproaches, but this is the first we recall, to the effect that the insect orders are changed each season. Other reasons given by the author for disregarding scientific classifications are expressed in the following sentences: "I was asked by an angling expert who was examining my drawings, "Why don't you give the proper Latin names to each fly?" My answer was, "I would do so, but no entomologist has yet made any effort to classify American trout insects into orders or divisions, families and species as has been done in France and England." (p. 102).

It appears, therefore, that the works of Hagen and of Banks, culminating in the latter's catalogue of the Neuropteroid Insects (1907), which includes all the browns, duns and drakes of Rhead, go for nothing, so far as this author is concerned. Similarly, the works of Osten-Sacken, and of Alexander and the Aldrich Catalogue of Diptera (1905) take care of all of his spinners and other flies, but he knows it not.

Our author makes the remarkable statement also that "Inquiries from various State entomologists failed to locate a single volume or treatise on trout-stream insects" (p. VII). He surely did not inquire of his own State entomologist, for the fact is, that New York State issued long before the date of Rhead's work two very valuable and well illustrated reports on this very subject. These are Needham and Betten's "Aquatic Insects in the Adirondacks" (1901), and "Aquatic Insects in New York State," by Needham, MacGillivray, Johannsen and Davis (1903). The shorter papers bearing more or less on trout stream insects, and publications on kindred topics are numerous.

Another work entitled "Fishing with floating flies" (S. G. Camp, 1913), varies somewhat from the book reviewed in nomenclature of insects, calling the May-flies duns and the caddis-flies sedges. It has the commendable feature, however, of quoting most of its entomological material from a standard work, namely Kellogg's "American Insects" (1905).—W. L. McAtee.

## RECENT CANADIAN PUBLICATIONS.

CLASS BOOK OF ECONOMIC ENTOMOLOGY—By Wm. Lochhead, (P. Blakiston's Son & Co., Philadelphia).

This compact book of 436 pages, many of them in reduced type, covers a wider scope of Entomology than any text book we have seen.

Part I (65 pages) deals with the structure, growth and economics of insects and is of special interest and value, not only because it describes in much more detail than usual the external and internal anatomy—especially the various types of mouth-parts—but also because it brings together in a clear and concise way much valuable data on such interesting subjects as beneficial insects, distribution of insects, insects and disease, and methods of studying insects.

Part II contains tables for the identification of insects injurious to farm, garden and orchard crops, separate tables being made for each host plant. Cross references are also given with each insect to the pages in the latter part of the book where such insect is described in more detail. This enables the student to verify his determinations. Tables of this nature though difficult to construct and seldom satisfactory would appear to be a valuable feature in a book of this nature.

Part III, the main part of the book (280 pages), deals with the classification, description and control of common insects. The old classification has been revised and brought up to date. Each order is treated in considerable detail and keys given not only to the families likely to be met with by the student, but also in many cases to the genera and in a few cases to the most common species. These keys should prove a boon to teacher and student.

Under each family the insects of economic importance are described and an account given of their life-history and the method of control. The total number of insects thus dealt with is large, possibly somewhat larger than necessary.

Towards the end of this part a few pages are assigned to the near relatives of insects, especially such pests as red spiders, sow-bugs, millipedes, slugs and eelworms. Control measures for these are also indicated.

Part IV discusses, in a general way, the control of injurious insects under such subjects as factors of control, cultural or preventive methods, artificial methods, insecticides, spraying, etc.

Although there are 257 illustrations, all of them good and valuable, more would have added to the merits of the book even though this meant an increase in size.

The compilation of a work of this nature, embracing so many aspects of Entomology, must have involved an enormous amount of labour and time, and the author is to be congratulated on the clear, concise way in which he has accomplished his task. The book has many merits and should be of great assistance in furthering the study of Entomology. Its chief defect so far as one can judge without having tested it in the class-room, would appear to be that an attempt has been made to include too many subjects, and while most of these have been well treated, the so-called strictly economic aspect of the work—the life-histories and control measures—have been somewhat sacrificed to the necessity for brevity.

L. CAESAR.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF NOVA SCOTIA FOR 1918.—No. 4. February, 1919. 89 pp., 7 plates.

In this volume we again have proof of the vigorous condition of our Maritime Branch. It contains 13 papers, many of which are important contributions to Canadian Entomology. Six of these papers deal mainly with the life-histories of particular insects, four with general questions of natural and artificial control, while only one is strictly taxonomic.

The following is a list of these papers:—

*A few notes on ant history and habits.* By Rev. H. J. Fraser. Pp. 6–9.

*The meaning of Natural Control.* By John D. Tothill. Pp. 10–14. An analysis of the factors operating in the natural control of Lepidoptera, with special reference to the Forest Tent Caterpillar and the Fall Webworm in New Brunswick. Tables are given, showing the average history of an egg-mass of each of these species during certain years.

*Further notes on the Apple Maggot (1918).* By W. H. Brittain. Pp. 15–23. In this paper tables are given to show the dates of emergence of 640 adults during the season of 1918, with maximum and minimum temperatures and associated climatic conditions. The time of emergence in early spring is practically the same, whether the season is early or late. Two other tables give dates of emergence according to the variety of apples infested. Experiments were also made to determine the length of the pre-oviposition period, under conditions of control in cages and in the open. It is shown that in certain orchards formerly infested by the apple maggot, but which were rid of the pest by spraying, these insects are now increasing, owing to the orchards having been untreated for two years.

*The Salt Marsh Caterpillar (Estigmene acraea Drury).* By H. G. Payne. Pp. 24–31. A detailed account of the life-history of this "woolly-bear," with descriptions of all the stages and a table giving dates of hatching, lengths of instars and other data on the seasonal history. The paper is illustrated by an excellent half-tone from a photograph.

*A Copper Dust.* By G. E. Sanders and A. Kelsall. Pp. 32–37. Gives the results of experiments with a mixture of powdered dehydrated copper sulphate, arsenate of lime and hydrated lime, containing 5 per cent. of metallic copper and 2 per cent. of metallic arsenic. Methods of preparation, storage and cost are also discussed. According to laboratory tests this mixture does not decrease the killing value of arsenicals to the same extent as liquid Bordeaux. Late potato blight was effectively controlled by it.

*Notes on the life-history and immature stages of three common Chrysomelids.* By W. E. Whitehead. Pp. 38–50. The species discussed are *Disonycha 5-vittata*, *Chrysomela scalaris* and *Gastroidea polygoni*, all of which are illustrated on plates 2 and 3. Full data on the seasonal history of each is given in tabulated form.

*A modified Bordeaux mixture for use in apple spraying.* By G. E. Sanders and W. H. Brittain. Pp. 51–61. An extended discussion of the properties and actions of the various formulæ used in the preparation of Bordeaux mixture, particularly with reference to the proportion of lime in its effect on the mixture as a fungicide. Conclusions believed to be correct for Nova Scotian conditions are given on pp. 59–60.

*Some notes on Olene vagans B. and McD. in Nova Scotia.* By W. H. Brittain and H. G. Payne. Pp. 62–68. Gives a full description of the life-history of this little-known tussock moth, with tables giving duration of stages. These are well illustrated on plate 4, from a photograph.

*Some miscellaneous observations on the origin and present use of some insecticides and fungicides.* By G. E. Sanders and A. Kelsall. Pp. 69–75. A useful article dealing with the properties and uses of the more important insecticides and fungicides, with particular reference to Nova Scotian practices.

*Notes on Lygus campestris Linn. in Nova Scotia.* By W. H. Brittain. Pp. 76–81. Discusses the distribution, host plants, injurious habits, life-history and control of this Mirid. The stages are illustrated on plate 5.

*Life-History and immature stages of Abbottana clemataria, Smith and Abbott.* By H. G. Payne. Pp. 82–85. The various stages are shown on plate 6, from a photograph.

*Key for determining the Crambinæ of Nova Scotia.* By E. Chesley Allen. Pp. 86–88. The key is based chiefly on the colour-pattern, and the 20 species listed are all illustrated on plate 7 by life-sized figures.

*A treehopper new to our list.* By W. H. Brittain. P. 89. Gives notes on *Enchenopa binotata* Say, recorded from Nova Scotia for the first time.

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The Apple Bud-moths and Their Control in Nova Scotia. By G. E. Sanders and A. G. Dustan. Bull. 16, (Technical Series), Entomological Branch, Dept. of Agriculture. March 1, 1919. 39 pp., 14 figs. in text.

This is a very thorough account of the habits and methods of control of the four commonest and most injurious species of Bud-moths found in the apple orchards of Nova Scotia, viz., the Eye-spotted Bud-moth (*Tmetocera ocellana*), the Oblique-banded Leaf-roller (*Cacoecia rosaceana*), the Lesser Bud-moth (*Recurvaria nanella*) and the Green Bud-moth (*Argyroploce consanguinana*).

"The bud-moths are the most serious orchard insects in Nova Scotia, probably causing more injury to apple orchards than all the other insect enemies combined. "It is estimated that in unsprayed or poorly sprayed orchards in Nova Scotia they reduce the crop about 30 per cent. About 75 per cent. of the bud-moths can be destroyed and the crops increased about 22.5 per cent. by two thorough applications of poisoned spray applied before the blossoms open, with a nozzle throwing a coarse driving spray."

"Open planting and thorough pruning help in the control of the bud-moths by allowing the wind to blow away and destroy many of the adults when they are on the wing in June and July."

The Eye-spotted Bud-moth is by far the most important of the four species, over 90 per cent. of the larvæ infesting buds being usually of this species.

Considerable difference exists in the susceptibility of different varieties of apple to bud-moth injury, the varieties having wrinkled twigs being almost invariably more heavily infested than those with smooth twigs, owing to the better hibernating quarters offered by the former to the half-grown larvæ.

Accurate data are given on the injuries to the buds and set of fruit, e. g., the exact reduction in the set as determined by counts of infested blossom clusters in the same variety of apple in the same orchard; the comparative size of the

apples from infested and uninfested clusters; the relation between spring and fall injury, etc.

The control of bud-moths is discussed at length, the measures recommended being based on a long series of experiments on different varieties of apple, using different sprays and nozzles.

The latter part of the paper is taken up with the detailed descriptions, life-history and habits of the four species discussed.

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The Fruit Worms of the Apple in Nova Scotia. By G. E. Sanders and A. G. Dustan. Bull. 17 (Technical Series), Entomological Branch, Dept. of Agriculture. March 1, 1919. 28 pp., 9 figs. in text.

The fruit worms discussed in this report are the larvæ of a number of Noctuid moths belonging to the genera Graptolitha, Conistra and Xylena. They are important enemies of the apple in Nova Scotia, and the damage which they effect by eating into the young fruit or the set of the apples causes the dropping of about 72 per cent. of the injured fruit and the deforming of about 78 per cent. of the remainder. The commonest species is *Graptolitha bethunei*.

The life-history of the various species is so similar that a general account is given which applies to all. The moths appear in the autumn, hibernate and deposit their eggs on the twigs of the apple during May. "These eggs hatch about the time the apple buds are beginning to show pink. The larvæ feed for two first two weeks on apple leaves and blossoms, and drop to the ground very readily when disturbed. After the first two weeks the larvæ feed more on the fruit than the leaves, causing an immense amount of injury." Pupation takes place in the ground in early July.

Fruit worms are difficult insects to poison, and their control is largely mechanical. The authors find that an arsenical spray applied immediately before the blossoms is the most valuable, while that applied immediately after the blossoms comes next in importance. The pre-blossom spray should be applied at a high velocity in serious outbreaks.

The latter part of the report consists of descriptions of the earlier stages of the nine species of fruit worms discussed.

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A Contribution to the Knowledge of the Bot-flies, Gastrophilus intestinalis, DeG., G. haemorrhoidalis, L., and G. nasalis, L. By S. Hadwen. D.V.S., (Dominion Pathologist, Health of Animals Branch) and A. E. Cameron, M.A., D. Sc., F.E.S. (Technical Assistant, Entomological Branch), Dept. of Agriculture, Ottawa. Bull. Ent. Research, Vol. IX, pt. 2, Sept., 1918.

An investigation into the life-histories and habits of the three species of horse bot-flies that occur in the western provinces. Detailed descriptions are given of the eggs and the manner of their deposition, the young larvæ and their method of entering the host. Experimental evidence is given to show that the eggs of *G. nasalis* and *G. haemorrhoidalis* are capable of hatching spontaneously, and that the larvæ probably penetrate directly into the integument of their host. The eggs of *G. intestinalis*, on the other hand, require moisture

and friction in order to hatch, and the larvæ experimented with failed to enter the skin but succeeded in entering the buccal mucosa.

The distribution of these flies in Canada, the habits of the adults and the period of activity is also discussed.

As a preventive measure against the attacks of *G. haemorrhoidalis* a nose fringe is recommended, consisting of a leather band around the nose and cut into strips long enough to cover the lips of the horse. An additional flap is attached to the band to protect the nose, and a piece of canvas, extending from the nose band to the throat, may be used to ward off attacks of *G. nasalis*.

Some New Species of Tachinidæ From India.—By John D. Tothill. Bull. Ent. Research, Vol. IX, pt. 1, May, 1918. Pp. 47–60, with 16 text figures.

This paper gives descriptions and figures of eight new species of Tachinid flies, which constitute the major part of a collection received from Dr. A. D. Imms. They belong to the genera Gymnochaeta, Servillia (2 species), Gonia, Paraphania, Chaetoplagia, Frontina and Lophosia.

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Some Notes on the Natural Control of the Oyster-shell Scale (Lepidosaphes ulmi L.). By John D. Tothill. Bull. Ent. Research, Vol. IX, pt. 3, March, 1919. Pp. 183–196, 7 figs. in text.

This study is based on an examination of about 18,000 egg-masses collected between September, 1916, and April, 1917, from representative places throughout Canada.

It was found that the most important single factor in the control of this scale is the predaceous mite *Hemisarcoptes malus* Shimer, a species of European origin, which feeds upon both the eggs and the growing scales. In some localities, e. g., Moncton, N.B., where the scale has been very abundant, it has been almost exterminated by the mite. In British Columbia, on the other hand, it has not yet been found. "As hundreds of the mites can be sent through the mail on an apple twig it should be possible to colonize it in scale-infested places and countries where it may prove to be absent from the local fauna."

Other important factors in the control of the summer stages of the scale are overcrowding of the scales and the Hymenopterous parasite *Aphelinus mytilaspidis* LeBaron, which in one locality was found to have destroyed 75 per cent. of the scales. E. M. W.

(To be continued.)

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## CORRECTION (*APHIDIDÆ*).

I am obliged to Dr. A. C. Baker for the information that *Heteroneura*, recently described by the writer in Canadian Entomologist, (1919, page 228) as a new genus to include *Aphis setariæ* Thos., is preoccupied. I am, therefore, proposing a new name, namely, *Hysteroneura*, as a substitute for *Heteroneura*.

John J. Davis.

## NOTES ON THE LARCH CASE BEARER (COLEOPHORA LARICELLA HBN.).

BY H. T. FERNALD, AMHERST, MASS.

During the present season (1919)the Larch Case Bearer has made its appearance in Northampton, Mass., apparently at the same place where it appeared in 1886, as recorded by Hagen (Can. Ent., XVIII, 125). A number of good-sized larches have been injured, the outer half of the leaf being thoroughly mined, causing the trees to look quite badly. By the middle of June all work was at an end and no moths could be found, and it is probable that at this time the insect was in the pupa stage.

On July 18th another examination was made, and eggs and newly-hatched larvæ were found in abundance. The egg is rather dome-shaped, its diameter at the base being about .3 mm., and its height the same or slightly less. It is of a grayish or brownish colour, apparently determined by the age of the embryo within, the more advanced eggs being darker. The centre of the top is irregularly roughened and about a dozen ridges diverge from this area toward the margin of the egg, the exact number of ridges varying somewhat in different examples. The surface between the ridges is minutely roughened, resembling the surface of an orange. The egg may be placed on either side of the leaf, but most frequently upon the upper one, and somewhere on its outer half.

The larva on hatching appears to enter the leaf, and forms its mine along one edge, working sometimes toward the tip, sometines in the other direction. At this time no trace of a thoracic shield could be found in any of the specimens examined, though quite high power lenses of a compound microscope were used, nor were any prolegs or spines on the body visible, except two or three of the latter on the head and prothorax, so small as to be extremely difficult to locate. The general colour of the larva was brown, but under the microscope appeared mottled with dark reddish. Unfortunately, it was not possible to carry the observations farther.

Mailed Novemober 20th, 1919

# The Canadian Entomologist

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## POPULAR AND PRACTICAL ENTOMOLOGY.

### FURTHER REMARKS ON COLLEMBOLA.

BY CHARLES MACNAMARA, ARNPRIOR, ONTARIO.*

(Continued from page 245.)

and more grateful air, come out in constantly increasing multitudes.

Experiments showed that a temperature of zero Fahrenheit killed *Achorutes socialis* in less than an hour, while at 5° F. they survived indefinitely. But although 5° F. seems to do them no harm, they never expose themselves voluntarily to that degree of cold. The lowest temperature at which I have seen them on the surface was 18° F., and that was very exceptional. As a rule they do not appear until the thermometer approaches 25° F., and from 30° F. upwards they reach their greatest abundance. Their reaction to a rising temperature is rapid. Even when the snow lies two feet deep or more, they are out within an hour or so after the milder weather begins, and after 24 hours of thaw they may be looked for in large numbers. No marked difference in response to temperature changes can be noticed between the various snow frequenters, and usually three or four different species can be found at the same time. In this district *Achorutes socialis* is generally in excess of all the others, but occasionally, for some reason or another, the mild weather fails to attract it, and *Isotoma nigra* or *I. macnamarai* may be the predominant species on the snow.

Outside of temperature, the other weather conditions have little influence on them. Provided the day is mild, they come out as readily in wind, pouring rain or heavy snow as in calm sunshine. During a snow-storm it is interesting to watch how they keep constantly climbing to the surface in order to avoid being buried by the falling flakes.

It is quite possible that sometimes the insects reach the surface by coming up straight through the snow. Their integument is far too delicate for any forceful burrowing, but snow lying loosely as it falls, always has interstices between its particles amply wide enough for the free passage of these minute creatures. This mode of emergence, however, cannot very often be used in mid-winter, for generally the snow stratum, when it attains any thickness, includes one or more layers of crust that are quite impervious to the soft-bodied springtail. Nevertheless, another exit is open to them. Around every stalk of grass, brushwood stem, tree trunk or other object projecting through the snow, there is always a clear space, no matter how deep the snow, resulting partly from the shrinkage of the snow as it settles, and partly from the radiation of absorbed heat by the object. It is from these sally-ports that the snow-flea hosts principally issue.

* We regret the awkward division of Mr. Macnamara's article. Through an unfortunate oversight the concluding sentence of the first part in the November number was left unfinished.

This method of reaching the surface together with other snow habits of the insect were well illustrated in an enormous outbreak of *Achorutes socialis* Uzel that I observed one day in February, and which may be taken as a good example of snow appearances in general. But here, in order to explain how I came on the insects on this occasion, I must make a slight digression.

*Achorutes socialis* has a strong and distinctive but inconstant smell. I have never seen any reference to it in literature, but Dr. Folsom tells me that he has noticed it both from *A. socialis* and from the closely allied *A. packardi*. It is not easy to describe, but it reminds me most of the smell of that favourite fruit-salad of the small boy: a slice of raw turnip. Sometimes the scent can be caught from half a dozen captives in a vial, at other times a hundred of them give off no appreciable odour whatever. Similarly, during an extensive emergence, sometimes no smell at all can be noticed, and sometimes it is so strong that it is possible to discover an outbreak of the insects by the sense of smell alone. The first time I experienced this I was walking through a hardwood bush one morning in December, and not thinking particularly of springtails, when it suddenly occurred to me that a few moments before I had smelled *Achorutes socialis*. I retraced my steps, and about 50 feet back there they were to one side of my path, coming out of a mossy log in thick, blue-black agglomerations.

It was in the same way that I discovered the insects this day in February. A favourite winter trail of mine at one place goes down the middle of a beaver meadow about half a mile long by 200 yards wide, through which in summer a small, sluggish stream meanders to a sandy bay of the Ottawa River. The meadow is bordered by an open growth of moisture-loving shrubs and trees, such as speckled alders, black and white ashes and soft maples These occupy a strip a couple of hundred feet wide, and on the drier ground behind, cedars, spruces, hemlocks and pines are mixed with elms and hard maples.

The temperature had been above freezing point for the preceding 24 hours, and three inches of wet snow had fallen in the night, bringing the total depth on the ground up to 18 inches. At noon the thermometer stood at 36° F., the sky was overcast, and the relative humidity was 91 per cent. It was not the kind of day that most people would choose for a snow-shoe tramp for the snow was very wet and the going heavy, but it was ideal snow-flea weather, so I was out bright and early. There was the usual sprinkling of *Isotomas* in the drier woods and *Achorutes* in the damper situations, but I found nothing out of the common until I reached the beaver meadow. Here, while pursuing my accustomed track, as I paused a moment to pick up a specimen, in an instant I caught the familiar smell of *Achorutes socialis*, wind-borne from the south side of the meadow. I followed up the scent and among the ashes and soft maples I found them.

They were coming up to the surface through the spaces in the snow around the trees and shrubs, some climbing the snow wall, and some the trunks and stems. Most of the latter sprang off on to the snow, but a good many remained on the trees, and either gathered in blue patches here and there or went wandering up the trunk, although not to any height, for above 10 feet I could find none. The principal area of emergence was between 50 ft. and 100 ft. wide, and extended all along the south side of the marsh,—a distance of about 800 yards. Over this space there were from 50 to 100 insects to the square foot.

Their movements as usual seemed to lack decision, but the net effect of their apparently purposeless walking and aimless leaping was to spread them out from under the trees in the direction of the light, and they thinned out towards the open meadow into successive bands of approximately 25, 10 and 5 insects to the square foot, until at last in the middle of the marsh only an occasional jumper was to be seen. While the boundary of this edge of the outbreak was indefinite, the other edge, as I had often noticed before in similar cases, ended sharply at the dark evergreens, and not a snow-flea was to be found in the shadows beneath these trees. The insects are evidently possessed of a positive phototropism, although it does not work with the accuracy and directness of the similar tropism of a great many other invertebrates. Another factor in snow-flea distribution is the wind. I once saw the insects blown out on the snow in a long comet tail radiating from the base of an ironwood around which they were emerging during a strong wind, and on this occasion I am sure the fresh southerly breeze aided their spread over the meadow.

By pacing the distances and carefully estimating the average number of insects to the square foot, I calculated that there were not less than 9,000,000 to 10,000,000 *A. socialis* disporting themselves on the snow along this narrow half-mile strip. They were of a well-grown generation, most of them reaching a length of 1.5 mm. with here and there a few 2 mm. individuals, which is the maximum length of the species. *A. socialis* seldom pays any attention to the close approach of the observer, but this day they were more alert than usual, and when I bent to examine a crowded alder stem with my magnifying glass, the occupants all flung themselves off on to the snow, and when, in focusing a wide procession wandering up a tree, I brought my face close to the trunk, a rain of the insects pattered down on my cheek and ear, and the raw turnip smell was very evident.

It was 11 o'clock in the morning when I reached the beaver meadow, and up to 5 p.m. there was no very apparent change in numbers or distribution of the multitude. They kept ceaselessly crawling and leaping, but without seeming to get anywhere in particular. About 5 o'clock, however, a slightly lower temperature set in, and with the first cool breath, the insects began to leave the surface by insinuating themselves between the snow particles, and by 5.30, when I had to leave for home, the numbers visible were noticeably diminished. The temperature was still above freezing, and it was evidently the downward trend and not the absolute degree that drove them to shelter. For although the thermometer registered no lower than 28° F. during the night, and stood at 31° at 9 o'clock next morning—temperatures at which the insects often emerge abundantly—when I got back to the marsh about half past nine, not a single *Achorutes* was to be found on the trees, and 95 per cent. of those on the snow had disappeared, as I ascertained by counting the few individuals remaining on areas I had marked out the day before.

In the course of the next few days I visited the place several times to study the further behaviour of the insects, and my observations may be conveniently summarized as follows:

When the colder and drier weather drives the snow-fleas to shelter, those on the trees and shrubs reach the soil by walking down the way they came up. The insects on the snow, however, show no tendency whatever to go back to

the openings by which they reached the surface, they simply work their way into the snow wherever they may be. Probably when the bed of snow is shallow and soft, they soon get down to the ground, but on this occasion their progress earthwards was decidedly slow. For more than a week after they had left the surface they were still to be found scattered through the snow at various depths. Trenches dug in the snow at several points revealed three crusts—the result of thaws earlier in the winter—each about an inch thick and separated one from the other by from three to seven inches of loose, dry snow. The tiny creatures seemed to have had little trouble in finding passages through the upper crusts, but the bottom crust was solid ice, and here in the first days of my investigations I found the snow-fleas accumulated in considerable numbers. Later on, these insects gradually disappeared. Although lacking any direct evidence, I am of the opinion that by degrees many of them worked their way along through the snow until they encountered some twig or root that pierced the crust and enabled them to crawl down to the earth. There is no doubt, however, that a very large number of the adventurers perish. The fact is that in six years' observation of their winter habits, I have never seen two large emergencies occurring in the same locality, indicates that a great destruction of the insects must take place on every excursion.

After all that has been said about their appearances in the winter, it might be thought that the insects only come out when the ground is covered with snow. The truth is that in favourable weather they emerge just as readily when the ground is bare, but, of course, they do not then attract attention as when they are set off by the vivid background of the snow.

One calm misty morning in that golden prime of spring when the first wild flowers are all out and the mosquitoes aren't, I came down through the woods, leafless as yet, to a marsh that was flooded a couple of feet deep with the high water from the Ottawa River. The whole half mile of swamp, I remember, was ringing from end to end with an astonishing chorus of frogs,—a great volume of sound, but so steady and sustained that presently, like the music of the spheres, it went out of my consciousness, until suddenly I was made aware of it again by the startling abruptness with which it stopped: a marsh hawk sweeping over the water had struck the massed choirs instantaneously dumb. As I worked my way through the alders along the edge of the water, I noticed a good many *A. socialis* climbing in the withered "beaver hay," the blue black colour of the minute insects rendering them conspicuous in the yellow grass As I advanced they became thicker, and here and there strings of them floated down runlets from the woods And then I came on the springtail metropolis. It was a large, moss-covered log so rotten that its species could not be determined, but it was probably a pine. It was bedded on the dead leaves of yester year just at the edge of the water, and from a crevice in its brown crumbling side, *A. socialis* were emerging in solid dark blue masses. The easiest way to appraise them would have been by dry measures. There must have been something over an imperial pint of them visible, and more were continually coming out of the log. On the damp leaves they were gathered into several patches six inches in diameter and fully half an inch thick. I filled a number of collecting tubes chockfull by merely scooping two or three times into these masses. A fine spray of leaping insects played continually over the side of the

log, and the characteristic smell was very apparent. And strange to say, the insects made themselves unexpectedly manifest to another sense also. Rivalling the fairy-tale hero who could hear the grass growing, to my surprise I found I could hear the springtails leaping on the dead leaves. So many hundreds of them were jumping at the same moment, that the myriad simultaneous impacts became audible even to the coarse human sense of hearing, and sounded like the tiny rain we must suppose fell in Lilliput.

Watching any general movement of these insects is like watching the hour hand of a clock. They were evidently spreading out from this focus, but so slowly in spite of all their leaping and crawling hither and thither, that very little change could be noticed during the thirty or forty minutes that I observed them. When I returned to the spot the evening of the following day, they had as usual nearly all disappeared. On the leaves were many white patches of cast skins, and a few stragglers were still crawling over the log, but the millions of yesterday were gone.

These eruptions of *Achorutes socialis* and its congeners are due to overcrowding of the domicile, and in that respect they parallel the swarming of the bees and ants. But there the resemblance stops, for, of course, the springtails have no special organization whatever, and those found living in colonies are merely kept together by a common interest in some food supply or other favourable condition. When the place becomes too small to support them, practically the whole population leaves at the same time, each individual to seek his own private fortune, and the old home is completely abandoned. One obvious advantage of the movement, in addition to a more abundant forage, is the cross-breeding that takes place between different colonies. The increased vigour of the race which accrues no doubt more than counterbalances the large mortality among the emigrants.

The Collembola as an order have never attracted many students, and it is not likely that this article will do anything to increase the number, but "should one heart throb higher at its sway," it would be a pity not to encourage the aspirant to springtail lore, and so I will say something about collecting methods.

The Collembolist's collecting outfit is simple, inexpensive and not at all bulky, but as the insects are found in a variety of situations, several different pieces of apparatus are necessary to capture them. Among the first requisites are the small straight-sided bottles without shoulder or lip, known as shell vials. For general use in collecting and for storage purposes, round-bottomed shell vials about 50 mm. long by 10 mm. in diameter, as recommended by Dr. J. W. Folsom, are best. But for very minute specimens even smaller bottles than these are often desirable, and I usually carry a few vials 40 mm. and 25 mm. long by 6 mm. or 7 mm. in diameter. If not obtainable from stock, any dealer will have such bottles as these made to order at a small cost per gross.

In summer a small fragment of damp, rotten wood or a piece of a moist, dead leaf tamped down into the bottom of the vial will keep the specimen from dying of aridity until you get them home. In winter, when everything outdoors is dried up by the frost, my bottles are furnished with a scrap of filter paper, which can be moistened when required by dropping a granule or two of snow on to it. But one must be careful not to get the bottles too wet inside, or the insects will drown in the water film.

The Collembola, being all very soft-bodied, must be handled with great delicacy to avoid injuring them. The best implement for the purpose is the fine red sable brush used for oil painting, American size No. 1, (English size 00 or 0), preferably of the round shape, but the flat will do. The long handles may be cut down to a length of three or four inches convenient for the pocket or vial case. In a pinch an emergency brush can be made by chewing the end of a small succulent twig into fibres.

A great many Collembolans live under the bark of more or less rotten logs and stumps, and when collecting in this habitat a large pocket knife is very useful to separate the layers of bark. Also the student, unless he has exceptional eyesight, will find a watchmaker's glass necessary to discover the smaller specimens. A glass of two and a half inch or at most two inch focus is strong enough. Any higher magnification leaves too small a working distance. To prevent dewing of the glass in cool weather, two or three holes of about 4 mm. diameter should be bored through the mounting.

As any small object dropped into forest litter or long grass is very hard to find, I tie the collecting brush and the watchmaker's glass at either end of a fine string about 18 inches long This insures their safety, leaves the hands free, and enables the brush to be found without taking the eye off the quarry. Of course, like every other good thing, the arrangement has its drawbacks. But when the cord catches on some obstruction just as a particularly fine specimen has been sighted, and the glass is jerked out of the collector's eye, curses both loud and deep will be found to afford considerable relief to many temperments.

The very ingenious collector devised by Berlese is an admirable instrument for automatically extracting springtails and other small creatures from the debris of forests and such like materials But for adequate results the apparatus must be employed on a larger scale than is possible for an amateur without any special laboratory. And so, while I have used a small Berlese collector with some success, I prefer to sift for the insects in the open. My sieve consists of a wooden hoop 12 inches in diameter and one inch deep, to which is attached a sleeve of ticking about 10 inches long, while the netting is wire cloth of 12 meshes to the inch. A black silk handkerchief and a white linen one complete the outfit. In practice, one sits down in a likely place, puts a couple of handfuls of dead leaves into the sieve and shakes it over the handkerchief spread on the knees. Then by means of the brush, the dislodged Collembolans are transferred to a vial. Changing occasionally from the black to the white handkerchief, or vice versa, often reveals many minute and unsuspected insects of the contrasting hue.

For springtails of a different milieu a very useful device is a tin funnel 3½ inches or 4 inches in diameter at the mouth, such as can be bought at any hardware store for a few cents. A fair-sized, straight-sided bottle is corked to the tip of the funnel, and the implement is used to sweep herbage, the surface of pools, wet sand and similar formations. The leaping insects are caught in the funnel, and a sharp tap from time to time shakes them from the slippery sides into the bottle. Also the easiest way to capture specimens on loose pieces of bark is to shake them off into the funnel. And the catch can be safely transferred from the funnel bottle to the regular collecting tube by inserting the

point of the funnel into the latter, and emptying the contents of the larger bottle into the funnel.

When he comes to use the brush, the collector soon sees that his manipulation must be varied according to the habit of the different species. The active high-strung *Isotoma* and the nervous *Tomocerus* must be "flipped" or herded into the bottle with a dry brush, while the non-leaping kinds, such as *Neanura* and *Onychiurus* and stolid genera like *Achorutes* and *Xenylla* can be picked up on a moistened brush without any trouble. Whatever others may say, the enthusiast sees no objection to moistening the brush with the lips. The absorption of an odd Collembolan that this practice may sometimes entail is entirely negative in result, as I can testify from several years' experience.

The insects are brought home alive, and are best killed, as Dr. Folsom advises, by the application of 95 per cent. alcohol heated almost to a boiling point. They may be then transferred to 80 per cent. alcohol for preservation. Springtails should never be mounted on points, as they soon shrivel up. Microscope preparations in Canada balsam, Dr. Folsom says, tend to shrink, and he suggests a mixture of glycerine jelly and acetic acid as the most satisfactory medium. An invaluable tool for "setting up" springtails and all other minute insects was discovered by Mr. J. M. Swaine, of the Entomological Branch, Ottawa, in the fine-pointed flexible wire instrument used by dentists to extract nerves, and known technically as a "broach."

As doubtless many collectors have discovered for themselves, the best work is done when one is alone. Unless your companion is equally interested with you in the particular insect you are after, his impatience and desire to move on distract, and his lack of sympathy chills you. I know people who could not watch one hour while a log was being examined with a magnifying glass, and whom even the discovery of a rare *Pseudachorutes* left quite cold.

## THE BEES OF GOLD HILL, COLORADO.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

Gold Hill is a small mining town in the mountains of Boulder County, Colorado, with an altitude of about 8,600 feet. It is rather well known in zoological circles because it was the residence of an indefatigable student of birds and mammals, Denis Gale. At Ward, a few miles away, Gale discovered the mouse which Merriam named *Evotomys galei*. On July 13, 1919, my wife and I spent the forenoon collecting bees at Gold Hill, on the dry hill immediately east of the town. Twenty species were obtained, listed below. The fauna is by no means entirely of the boreal type; one species, *Andrena prunorum*, extends to Southern New Mexico.

*Prosopis varifrons* Cresson. Females at *Rubus*.

*Colletes kincaidii* Ckll. Both sexes abundant at flowers of *Frasera* (*Tessaranthium*).

*Sphecodes eustictus* Ckll. Female at *Geranium*.

*Halictus cooleyi* Crawford. Common, visiting *Frasera*.

*Halictus lerouxii* Lepeletier. One male.

*Halictus nigricollis* Vachal. One male. Described by Vachal from a male

in the Vienna Museum, collected by Morrison in Colorado, and not previously recognized by me.

*Halictus arapahonum* Ckll. One male, this sex previously unknown. It is like *H. provancheri nearcticus* (Vach.), but the abdomen is olive green, with very distinct, faintly ochreous hair bands. Femora light ferruginous, without dark markings.

*Halictus pruinosiformis* Crawford. One female.

*Halictus ruidosensis* Ckll. One female; a rather large form with strongly dusky wings, perhaps separable.

*Halictus galei*, n. sp. ♀. Length about 4.5 mm.; head and thorax bluish green, not bright, somewhat shining but not polished; hair of head and thorax white, not dense; head oblong, facial quadrangle much longer than broad; front minutely excessively densely punctured all over, but this does not extend to the region between the ocelli; antennæ black, flagellum obscurely reddish beneath toward end; tegulæ dark, not punctured; wings clear hyaline, nervures and stigma testaceous; mesothorax microscopically tessellate and with distinct punctures, about the diameter of a puncture apart; area of metathorax with very irregular strong plicæ, and smaller ridges between, the apical part hardly sculptured; its surface microscopically reticulate; legs black; hind spur with three long spines; abdomen black, shining; sides of second segment (especially basally) and all of the following covered with white hair, not so dense as to entirely hide the shining surface, the little hairs beautifully plumose; hind margins of second and following segments narrowly pallid.

In my manuscript key to the subgenus *Chloralictus* this runs to *H. perdifficilis* Ckll., which it resembles in the hairy abdomen. It differs from *perdifficilis* by being very much smaller, with narrower head, and also in coloration. The narrower face, with straighter inner orbits, at once separates it from *H. ruidosensis*, but the peculiarity is not carried nearly so far as in *H. longiceps* Rob., which I have from Southern Pines, N. C. (*Manee*).

*Andrena lupinorum* Ckll. Common on flowers of *Rubus*, and also collected from *Potentilla*. I had only the type of this fine species.

*Andrena apacheorum* Ckll. One female at *Potentilla*.

*Andrena prunorum* Ckll. Female at *Rubus;* scape red, clypeus mainly red.

*Melissodes confusiformis* Ckll. One male at *Geranium*.

*Epeolus hitei* Ckll. One male at *Geranium;* differs from the female by having the first two antennal joints black, and the third red only in part. I had only the unique type of female.

*Anthophora smithii* Cress. One male.

*Chelynia elegans* Cress. One male at *Geranium*.

*Osmia armaticeps* Cress. One female at *Gaillardia*.

*Megachile pugnata* Say. Both sexes at *Gaillardia*.

*Bombus juxtus* Cress. Workers common on *Frasera*.

The *Rubus* referred to is *R. melanolasius* Focke.

Summing up the principal results; the morning's collecting gave us one new species, two previously unknown males, one species described in Europe and not before recognized by us, and several specimens of a species of which we previously had only the single type. Also, the *M. confusiformis* was the first male in good condition. In connection with Mr. Sladen's recent interesting

observations on the relation between climate and characters, it may be of interest to note that in a considerable series of *Chloralictus*, the tegulæ are dark in those species which come from the north and the mountains, light in those from the south and lowlands. Thus:

Tegulæ dark. *H. cressonii, nigroviridis, viridatus, perdifficilis, versans, ruidosensis, hortensis, planatus*, etc.

Tegulæ light. *H. semibrunneus, sparsus, floridanus, ashmeadii, versatus, zephyrus, gemmatus, bruneri, exiguus*, etc.

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## A LIST OF SYRPHIDÆ OF NORTHERN INDIANA.

BY M. R. SMITH, RALEIGH, N.C.

The following is a list of Syrphids collected in the vicinity of Plymouth, Indiana, during the summer of 1918. As the writer does not think he will have opportunity to collect in this region again, this short list is being published with the hope that it may be of interest to the Syrphidologist and to those interested in working up the State's fauna.

To Mr. J. M. Craig much credit is due for assistance in collecting.

The writer also wishes to acknowledge his indebtedness to Mr. C. L. Fluke for a number of the determinations.

UPLAND SPECIES.

*Eristalis tenax* Linn.
*E. arbustorum* Linn.
*E. transversus* Wied.
*E. dimidiatus* Wied.
*Sphaerophoria scripta* Linn.
*S. cylindrica* Say.
*Paragus bicolor* Fabr.
*P. tibialis* Fabr.
*P. angustifrons* Loew.
*Allograpta obliqua* Say.
*Mesogramma marginata* Say.
*M. geminata* Say.
*M. polita* Say.
*Syrphus ribesii* Linn.
*S. americanus* Wied.
*S. xanthostomus* Williston.
*S. abbreviatus* Zett.
*Syritta pipiens* Linn.
*Milesia virginiensis* Drury.
*Spilomyia hamifera* Loew.
*S. longicornis* Loew.
*Baccha fascipennis* Wied.
*Xanthogramma flavipes*.

MARSH SPECIES.

*Helophilus similis* Macq.
*H. latifrons* Loew.
*H. divisus* Loew.
*H. chrysostomus* Williston.
*H. conostomus* Williston.
*H. laetus* Loew.
*Volucella evecta* Walker.
*Xylota fraudulosa* Loew.
*X. ejuncida* Say.
*Tropidia quadrata* Say.
*T. calcarata* Williston.
*Pyrophaena rosarum* Fabr.
*P. granditarsus* Fabr.
*Platychirus quadratus* Say.
*P. hyperboreus* Staeger.
*Melanostoma mellinum* Linn.
*M. obscurum* Say.
*Neoascia globosa* Walker.
*Chrysotoxum pubescens* Loew.
*Pterallastes thoracicus* Loew.
*Eristalis bastardi* Macq.
*E. flavipes* Walker.

## THREE NEW CANADIAN ANTHOMYIIDÆ (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

The three species described in this paper were submitted to me for identification, and in order to include them in synopses which are ready for the press, they are now described in full.

The generic name Aricia R.D., is preoccupied and the next available one Helina R.D., is used in this paper.

### Helina fletcheri, sp. n.

*Male.*—Black, so densely covered with gray pruinescence as to appear opaque gray. Orbits, face and cheeks with silvery pruinescence, antennæ and palpi black. Thorax without vittæ. Abdomen with a faint dark dorso-central vitta, and a pair of small brown spots on segment 2 and another on segment 3. Legs black. Wings clear, veins pale, yellow at bases. Calyptræ and halteres pale yellow.

Eyes bare, separated by about 3 times the width across posterior ocelli; interfrontalia at its narrowest part a little wider than either orbit; each orbit with 3 or 4 strong bristles and one or two weak hairs parafacial at base of antennæ about as wide as third antennal segment, a little narrowed below; cheek not over twice as high as width of parafacial, with a series of bristles along lower margin, 2 or 3 of which, below anterior margin of eye, are upwardly curved a bristle above vibrissa; longest hairs on arista a little shorter than width of third antennal segment. Thorax without strong presutural acrostichals or prealar bristle; postsutural dorso-centrals 3; sternopleurals 3, in a nearly equilateral triangle. Abdomen cylindrical, slightly tapered behind; tergites 3 and 4 each with transverse median and apical bristles; hypopygium large but not protuberant, fifth sternite with a rather wide, deep, wedge-shaped posterior excision, a few long bristles on each lateral extension. Fore tibia with or without a median bristle, only the dorsal apical bristle strong; fore tarsus about equal in length to fore tibia; all pulvilli longer than apical tarsal segment mid femur with a complete series of long, strong bristles on postero-ventral surface, the antero-ventral surface bare; mid tibia with 1 weak antero-dorsal and 2 or 3 posterior bristles; hind femur with a series of long bristles on postero-ventral surface and another on apical half of antero-ventral; hind tibia with 2 or 3 short bristles on antero-ventral and postero-dorsal surfaces and 2 longer bristles on antero-dorsal, the apical antero-dorsal bristle long. Costal thorn small, outer cross-vein straight; veins 3 and 4 divergent apically; last section of fourth vein over twice as long as the preceding.

Length 5 mm.

*Type.*—Radisson, Sask., July 30, 1907, (J. Fletcher), in the Canadian National Collection.

This species has the appearance of a Coenosia. It differs from any other North American species known to me in having the eyes widely separated,the femora very strongly bristled and the postsutural bristles 3 in number.

### Hylemyia pedestris, sp. n.

*Male.*—Black, slightly shining, densely gray pruinescent. Head black, orbits, face, and cheeks with white pruinescence; palpi largely yellowish basally. Thorax with 5 black vittæ—a narrow median, two narrow submedian, and two

broad lateral. Abdomen with a narrow black dorsal vitta, which is obsolete on apical portion of basal segment; hypopygium glossy black. Legs yellowish testaceous, coxæ, femora and tarsi largely fuscous, sometimes the femora almost entirely fuscous, or almost entirely pale. Wings slightly grayish, yellow at bases. Calyptra and halteres yellow.

Eyes separated at narrowest part of frons by a distance equal to width of anterior ocellus; parafacial at base of antenna about half as wide as third antennal joint, much narrowed below; cheek as high as width of third antennal joint, with a few long bristles along lower margin, one of which is upwardly curved, antennæ reaching nearly to mouth-margin; arista with very short pubescence. Thorax with 2 or 3 pairs of presutural acrostichal bristles and a few intermixed setulose hairs; prealar less than half as long as the bristle behind it. Abdomen short, depressed, parallel-sided; hypopygium large; fifth sternite in both specimens before me projecting downward, large, the processes slightly curved, rounded at apices, their inner halves furnished with dense, erect black hairs, a rounded elevation laterad of base of each process on each of which there are a few bristles. Fore tibia with a short, sharp apical posterior bristle; mid femur with a few bristles near base on postero-ventral surface; mid tibia with 1 postero-dorsal and 2 posterior bristles; hind femur with antero-ventral bristles long and widely separated, the postero-ventral surface with a rather closely placed series of short bristles on basal three-fifths; hind tibia with 1 antero-ventral, 2 antero-dorsal, and 2 postero-dorsal bristles; mid and hind tarsi shorter than their tibiæ. Costal thorn small, outer cross-vein slightly curved, veins 3 and 4 subparallel apically, the former terminating almost in the apex of the wing which is slightly pointed.

Length 5.5 mm.

Type and paratype, Godbout, Quebec, Canada, July 25, 1918, (E. M. Walker). Named in honour of the collector.

The series of short bristles on basal two-fifths of hind femora and the fringes on processes of fifth abdominal sternite distinguish this species from any known to me.

Type in the Royal Ontario Museum of Zoology, Toronto.

**Hylemyia quintilis,** sp. n.

*Female.*—Black, shining, rather densely gray pruinescent. Head entirely black, the orbits and parafacials with white tomentum, the remainder of head with less dense pruinescence. Thorax with 5 poorly defined brown dorsal vittæ. Abdomen more distinctly shining than thorax, with a large patch of gray pruinescence on each side of each tergite posteriorly. Legs black. Wings with a yellowish brown tinge, veins dark brown, yellow basally. Calyptræ white. Halteres yellow.

Frons over one-third of the head-width, a little widened anteriorly, orbits well defined, each about one-fourth as wide as interfrontalia at anterior extremity of ocellar triangle, and with 3 bristles in front of lower supraorbital bristle, otherwise bare, interfrontalia with a pair of strong curciate bristles, and a few microscopic hairs on each side, ocellar triangle with 2 long bristles and several long setulæ, parafacial at base of antennæ wider than height of cheek and a little wider than third antennal joint, narrowed below, the vibrissal angle much produced, anterior upper margin of mouth forming a sharp ridge which

projects well beyond the line of anterior margin of frons; lower margin of cheek with a few strong bristles in a single series and some short weak hairs, the series of strong bristles widely interrupted below parafacial; third antennal joint broad, about twice as long as second, arista almost bare, second joint longer than thick, third swollen at base. Presutural acrostichals 2-rowed, one pair strong, prealar bristle long; sternopleurals 2:2, the lower anterior one weak. Abdominal tergites with strong bristles on posterior margins; sternites 3 to 5 each with strong bristles on lateral margins, basal sternite bare. genitalia with two slender processes at apex. Fore tibia with a strong median posterior bristle, basal joint of fore tarsus nearly as long as the other four combined, third, fourth, and fifth joints broadened, third twice as long as fourth, the latter one-third as long as fifth, which is about three times as long as broad, mid legs lacking, hind femur with about 8 bristles on apical three-fifths of antero-ventral surface, and 1 bristle near base on postero-ventral; hind tibia with 3 short antero-ventral, 3 moderately long and 4 short antero-dorsal, and 3 long and 5 or 6 short postero-dorsal bristles. Costal thorn short; veins 3 and 4 subparallel apically, last section of the latter not much longer than the pre ceding section.

Length 7 mm.

Type.—Godbout, Quebec, Canada, July 25, 1918, (E. M. Walker).

This species resembles the female of *latipennis* Zetterstedt, in having the apical fore tarsal joint dilated, but *latipennis* has the fourth joint much longer, distinctly longer than wide, the hind femur with 2 or 3 bristles on apical fourth of antero-ventral surface, and the hind tibia with 3 long bristles on the postero-dorsal surface, the short bristles being absent.

Type in the Royal Ontario Museum of Zoology, Toronto.

## NOTES ON PLATYDEMA ELLIPTICUM FAB., AND ITS FUNGUS HOST.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

During the middle of September, larvæ and pupæ of this species were quite abundant in the fungus *Polyporus gilvus* at Union, N.J. Many of the larvæ were full grown at this time, and adults had just started to emerge. Larval burrows were found throughout the fungus, but most of the pupal cells were located in the base of the fungus close to the bark of the tree. *Polyporus gilvus* is a woody fungus which is extremely common in Eastern Canada and Northern United States, occurring on dead deciduous wood.

Full grown larva.—Length 12 mm. Greatest width 1.7 mm. Elongate, subcylindrical, somewhat hard, whitish or with dark contents of alimentary tract showing. Head and anterior portion of first thoracic segment dark, reddish brown. Faint to dark transverse chitinized areas on dorsal surface of each segment. Head with a fine, white, U-shaped line which connects with a fine, median, dorsal line extending to first abdominal segment. Head bears a few punctures within the U-shaped line and many without. Head and body sparsely hairy. Legs bearing several spine-like hairs. Last abdominal segment bearing a row of five minute spines on its posterior edge, the middle spine being the largest.

Pupa.—Length 7 mm. Width across wing-cases 3 mm. Whitish, subovoval, rounded anteriorly, gradually tapering posteriorly. Head, thorax and ventral surface sparsely hairy. Dorsal surface bears a number of fine, minute hairs. Hairs on anterior and lateral thoracic margins long and fine. Lateral body hairs longest. Sides of abdominal segments two to five produced into somewhat flat, plate-like, subrectangular, expanded tubercles. Anterior and posterior transverse edges of each expansion or tubercle chitinized and serratulate, the distal corner ending in a minute spine. Lateral edge of expansion bears a minute, median spine with a long hair arising from below the tip. The lateral expansion on the first abdominal segment has a heavily chitinized posterior edge, a minute, median, lateral spine but the anterior edge is not chitinized nor serratulate. Lateral expansion on sixth abdominal segment is smaller than the others and lacks the posterior edge. Last abdominal segment terminated at each edge by a comparatively prominent, pointed spine.

Adult.—*Platydema ellipticum*. This was described by Fabricius in 1801 (Syst. Eleut., II, 1801, 566). The beetle is elongate-oval, about 6 mm. long, black, each elytron having an oblique irregular reddish spot extending from the humerus to the suture. The thorax is finely and sparsely punctate, the elytra finely striate and the striæ with fine, distant punctures. It is generally distributed throughout New Jersey and occurs according to Smith (Insects of N.J., N.J. St. Mus. Rept. 1909) under the bark of fungus-covered trees. Blatchley (Coleoptera of Indiana) states that it is frequent in the southern half of Indiana beneath bark on fungus-covered logs. Up to the present time this species has been found associated only with *Polyporus gilvus* in New Jersey, but it is extremely probable that it breeds in other woody fungi also.

## A NEW ANTHOMYIID FROM LABRADOR (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

The species described herein I have placed in the genus *Helina* Robineau Desvoidy (*Aricia* auct.) with some hesitation. The genus is, however, decidedly composite and pending a satisfactory subdivision of it the present arrangement is the best available. Stein in all his more recent papers on Anthomyiidæ uses the name *Mydæa* for this genus, but that name is, as I have pointed out in several of my papers, properly applicable to the small group of which *pagana* Fabricius is the type.

**Helina tuberculata,** sp. n.

*Male*.—Black, shining, with conspicuous gray pruinescence. Head entirely black. Thorax with 4 broad, black vittæ. Abdomen with a pair of large, ill defined, subtriangular black spots on second and another on third segment. Legs black. Wings slightly brownish, more distinctly so along the courses of veins, yellowish basally. Calyptræ and halteres orange yellow.

Eyes distinctly hairy, separated by about width across posterior ocelli; parafacial at base of antenna at least as wide as third antennal joint at apex, not narrowed below; third antennal joint broadened apically, second with several long bristles above; arista short pubescent. Thorax with or without a pair of long presutural acrostichals; prealar bristle at least half as long as the bristle behind it; postsutural dorso-centrals 4; hypopleura bare; sternopleurals 1: 2; scutellum bare below and on sides. Abdomen ovate; first sternite bare;

fifth sternite with a broad shallow posterior emargination, a number of long bristles on each side at base of emargination, the lateral projections bare. Fore tibia without median bristle; mid femur gradually thickened to beyond middle, then rather abruptly attenuated to apex, a group of strong bristles at apex of swollen part on antero-ventral surface, and two or three bristles near base on postero-ventral surface; mid tibia slightly distorted, with about a dozen strong bristles on basal half of posterior surface, a small tubercle one-third from apex on same surface, and dense, short bristles on ventral surface from base to and covering the tubercle; hind femur slightly curved, slender basally, with a number of long bristles on apical half of antero-ventral surface; hind tibia very slightly curved, antero-ventral surface with about 9 short bristles, antero-dorsal surface with five or six short bristles, the posterior surface with about eleven long bristles on apical three-fifths. Third and fourth veins much divergent apically. Lower calyptra about twice as large as upper.

Length 9 mm.

Type.—Rigolet, Labrador, July 18, 1906.

This species has the hind tibia armed almost as in *pectinata* Johannsen, but the peculiar mid tibia separates the species from it and all other species known to me from this country or Europe.

This specimen was sent to me by Mr. C. W. Johnson, and pending its final disposition the type is in the collection of Illinois Natural History Survey.

## A PLEA FOR MORE ACCURATE TAXONOMY IN MORPHOLOGICAL AND OTHER STUDIES.

BY MORGAN HEBARD, CHESTNUT HILL, PA.

It has been noted by the author that morphologists and students interested in specialized studies of certain species are often inclined to give imperfectly or inaccurately the necessary taxonomy for the material treated.

This is understood only when we realize that the subject treated is of great interest in such papers, the proper name for the material studied often of little or no interest to the morphologist.

That the correct name is of very great importance it would seem must be admitted by all, when it is pointed out that from different species, though sometimes apparently very closely related, different results are often obtained, even from morphological studies.

It is true that the systematic work of the past has often left much to be desired, and many changes have been necessitated thereby. That, however, should not warrant slurring systematics any more than that equally unsatisfactory past work of morphologists and reversal of conclusions should cause interest in morphology to wane. The advance of all science is built in part upon the correction of past errors.

Another excuse for lack of proper taxonomic assignment is that it is often difficult to secure the required names from a systematist. This is indeed sometimes true, but, in the great majority of cases, one fiftieth the time and effort expended in preparing the material in question for study, would have secured the necessary determinations.

As a concrete instance, we would note Mr. E. Melville Du Porte's recent article, "The Propleura and the Pronotal Sulci of the Orthoptera."(1)

(1) Can. Ent., LI, pp. 147 to 153 (1919).

This excellent paper treats, in a masterly way, a most interesting subject. It is marred solely by inaccurate or incomplete taxonomy. The taxonomic faults may be summarized as follows:

*Acridiidæ* = *Acrididæ*.

*Rhomalea* = *Romalea*.

*Tettigidæ* = *Acrydiinæ*.

*Tettix granulatus* = *Acrydium granulatum*.

The references in this paper to *Acrydium* are correctly referable to that genus, of which *granulatum* is a member.

*Locustidæ* = *Tettigoniidæ*.

*Conocephalus* = *Neoconocephalus*, a genus including but few North American species. It has been recently revised and the specific determination would, in consequence, have been easily made.

*Xiphidium* = *Conocephalus*.

*Microcentrum*. As there are but two, widely distributed, North American species of this genus, *laurifolium* and *retinerve*, the specific assignment could have been readily made.

*Gryllus pennsylvanicus* = *Gryllus assimilis*.

The taxonomy in this paper could have been corrected by a systematist in a few minutes. Would it not be desirable to have all such papers correct throughout, rather than satisfactory as far as the subject being studied is concerned, but full of inexcusable taxonomic flaws?

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NOTE ON MR. HEBARD'S ARTICLE.

The Editor, having given some attention to the taxonomy of the Orthoptera, was aware that the nomenclature followed in Mr. Du Porte's paper was not up to-date, but considered it inadvisable to alter it, since the names employed have long been in common use, and are more or less familiar to the general student, for whom the paper is intended. The nomenclature of Orthoptera has undergone numerous changes in late years, and some of these changes, though doubtless necessary, if the law of priority is to be followed, are of a most unfortunate character. Many old familiar generic terms have been abandoned, or what is more confusing, transferred to other forms. For example, the little "grouse-locusts," generally known as *Tettix* are now *Acrydium*, while the large locusts formerly called *Acridium* are now *Locusta*, a name which used to be employed for insects of another family. Again, the name *Conocephalus*, so long and appropriately given to the large "cone-headed grass hoppers" must now be shifted to the little meadow grasshoppers familiar to all as *Xiphidium*, the cone-heads becoming *Neoconocephalus*. Such changes as these are, of course, very confusing to all but the specialist. Were they really permanent, it would indeed be desirable to promote their use as rapidly as possible, but what guarantee have we that they will remain more than a few years? They are not even universally accepted by specialists.

Is there such a thing as "correct taxonomy?" We think, at least, that systematists are inclined to over-estimate its importance; and while we agree with Mr. Hebard's contention that morphologists are too apt to be careless in regard to taxonomic matters, we think that the converse is equally true, that the systematist is usually very inaccurate in the use of morphological terms, and indifferent as to the morphological significance of the structures he describes.

## RECENT CANADIAN PUBLICATIONS.

(Continued from page 263.)

The Apple Maggot.—By L. Caesar, B.A., B.S.A., Provincial Entomologist, and W. A. Ross, B.S.A., Entomological Branch, Dominion Department of Agriculture. Bull. 271, Fruit Branch, Ont. Dept. of Agriculture. Pp. 1–32, with 17 figures in text.

The investigation upon which this excellent bulletin is based was commenced in 1911, when the apple maggot was abundant in many parts of Ontario, and has been continued during each succeeding year. It contains a detailed account of the life-history of this insect, with full data on its seasonal history, habits, distribution, influence of environmental factors and methods of control.

Although normally the life cycle is completed within a year, a certain number of pupæ remain in the soil during a second winter, the flies emerging the following summer. There is also in the warmer parts of Ontario a partial second brood in some seasons, though a very insignificant one. The time of emergence of the flies, which begins as a rule about the first week in July, and continues throughout most of August, is not influenced by the time of pupation, i. e., flies from pupæ from early varieties of apples do not appear to emerge any sooner than those from later varieties.

Natural control seems to depend mainly upon weather factors, parasites being apparently of very minor importance. Hardening of the soil surface, as a result of heavy rains followed by drought, may either prevent the flies from emerging or the larvæ from pupating beneath it, and large numbers may perish in these ways.

Much variation exists in the susceptibility of different varieties of apples and crabs to infestation.

The most effective control measures are found to consist in spraying with arsenicals, the mixture recommended being arsenate of lead paste, 2½ lbs. to 40 gallons of water, without any molasses or other sweetening. "The first application should be given as soon as the flies begin to emerge, so that they may be killed before they can lay eggs," the proper date of application in an average season varying according to the district, from June 25, in the warmest parts of the province, to July 7 in the more northerly localities. A second application should be made as soon as the first shows signs of disappearing, and a third may be necessary if heavy rains should wash off the second, and is recommended in all cases the first year after a bad infestation.

Good figures from original photographs are given to illustrate the different stages of the insect and its work on the apple.

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Report of the Provincial Museum of Natural History for the Year 1918, Province of British Columbia.—Victoria, 1919. Pp. T 1–16, with 2 plates. Entomology. By E. H. Blackmore.

Mr. Blackmore's article constitutes the greater part of the report (pp. 6–13), and consists chiefly of notes on the occurrence of uncommon insects taken in British Columbia during the season of 1918. These include 12 species, belonging to several orders, that were described as new during the year, and a

considerable number of Lepidoptera, 20 species of which are illustrated on the two plates by excellent half-tones from photographs.

Four species of this order are reported as having been present in the province in destructive numbers, viz., the forest tent-caterpillar (*Malacosoma pluvialis*), the tortoise-shell butterfly (*Aglais californica*), the alfalfa looper (*Autographa californica*) and a tussock moth (*Hemerocampa vetusta gulosa*), which was devastating Douglas Fir at Chase, B.C.

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REPORT OF THE CANADIAN ARCTIC EXPEDITION, 1913–18.—Vol. III—Insects. Southern Party 1913–16. Ottawa, 1919.

Six parts of this volume have thus far been issued. Most of the collections in all the orders were made by Mr. Frits Johansen, and a large part of the material was collected at Bernard Harbour, Dolphin and Union Straits, Northwest Territories, and at Nome and other localities on the Arctic coast of Alaska.

Part A, Collembola. By Justus W. Folsom. Pp. 1 29, including 8 plates with 72 figures. This is a very full report on the 12 species and varieties of springtails taken by Mr. Johansen. All the species are described and the characters well illustrated. An extensive bibliography is also given. The species are distributed among the following genera: Podura (1); Achorutes (2, 1 n. sp.); Onychiurus (1 n. sp.); Tetracanthella (1); Isotoma (2 sp.); Entomobrya (1); Lepidocyrtus (1); Sminthurides (1).

Part B, Neuropteroid Insects, by Nathan Banks. Pp. 1–5 with 1 plate. Only two orders are represented in the collection, the Plecoptera and the Trichoptera, three species of the former and four of the latter having been taken. One species of each order is described as new, a Capnia and an Anabolia, but other new forms may be present as the specimens are not all specifically determinable.

Part C. Diptera. Craneflies; by C. P. Alexander. Mosquitoes; by H. G. Dyar; Diptera (excluding Tipulidæ and Culicidæ); by J. R. Malloch Pp. 1–90, with 10 plates.

Craneflies. The collection is relatively rich in these forms, there being at least 16 species represented, including one Rhyphid (a Trichocera, represented by larvæ only) and 15 Tipulidæ. Five of these belong to the Limnobiinæ, embracing 4 genera, and 10 to the Tipulinæ, representing 3 genera. The largest genus is Tipula with 7 species. With but two exceptions the craneflies of this collection all belong to new species.

All the species, including larval forms, are fully described and figured.

Mosquitoes. Only two species are represented among the 134 specimens in the collection, both belonging to Aedes (Ochlerotatus). One of these, taken in large series and also reared is described as new, *A. nearcticus*. The other species is represented only by females and was left unnamed.

Diptera (exclusive of Tipulidæ and Culicidæ); pp. 34–90, pls. VII X. These belong to 18 families in which they are distributed as follows: Sciaridæ, 3 sp.; Chironomidæ, 16 sp. (with a new species each in Tanypus and Diamesa); Simuliidæ, 6 sp. (1 n. sp. each in Prosimulium and Simulium); Leptidæ, 1 sp.;

Empididæ, 7 sp. (all Rhamphomyia, 5 new); Dolichopodidæ, 6 sp. (1 n. sp. each in Dolichopus and Hydrophorus); Phoridæ, 3 sp. (all Apiochæta, 2 n. sp.); Borboridæ, 1 sp., a new Leptocera; Syrphidæ, 8 sp.; Oestridæ, 2 sp.; Tachinidæ, 2 sp. (1 new Peleteria); Calliphoridæ, 4 sp. (1 new Phormia); Anthomyiidæ, 26 sp. (n. sp. in Phaonia, 1 Mydæina n. gen., 1 Aricia, 1 Hydrophoria, 1 Alliopsis, 1 Hylemyia and 1 Phorbia); Scatophagidæ, 8 sp. (1 n. sp. each in Gonatherus and Cordylurella, n. gen., Dasypleuron n. gen., and Allomyia n. gen.; Helomyzidæ, 3 sp. (1 n. sp. each in Oecothea and Neoleria); Piophilidæ, 1 sp. (a new Piophila) and Chloropidæ, 1 sp.

Much of the material in the collection was specifically indeterminable, so that it is probable that it contains a considerable number of undescribed species.

This paper also contains keys to the genera of Phaoninæ and Anthomyiinæ, and to those of the entire family of Scatophagidæ and Helomyzidæ.

Part D, Mallophaga and Anoplura. Mallophaga; by A. W. Baker; Anoplura, by G. F. Ferris and G. H. F. Nuttall. Twenty species of Mallophaga are listed from 13 bird hosts and one mammal. All belong to described species with the possible exception of three species which were too immature for specific determination. Four of the species are illustrated on the plate. Only three species of true lice or Anoplura were taken, one of these being the human head louse, collected from the head hairs of copper Eskimos.

Part F, Hemiptera, by E. P. Van Duzee. Pp. 1–5. The scarcity of Hemiptera in the Arctic regions is indicated by the small size of the collection, which consists of but 12 species. Only 6 of these were specifically determinable, one species being described as new, viz., *Euscelis hyperboreus*, n. sp.

Part H, Spiders, Mites and Myriopods. Spiders, by J. H. Emerton. Acarina, by Nathan Banks. Chilopoda, by Ralph V. Chamberlin.

Spiders (pp. 1–9, pls. I–III). The collection of spiders include 13 species of which three are described as new. They are distributed among the following genera: Erigone (1), Typhlocræstus (1), Tmetocerus (2, 1 n. sp.), Microveta (2, 1 n. sp.), Epeira (1), Dictyna (1), Lycosa (2, 1 n. sp.), Pardosa (2), and Xysticus (1).

Descriptive and distributional notes are given on many of the species and structural details of most of the forms are figured.

Acarina, (pp. 11–13). The mites belong to 7 families, 14 genera and 17 species, only one of which is described as new. (*Stigmæus arcticus*, figs. 1 and 2). They belong to the genera Rhagidia (1), Bdella (3), Bryobia (1), Stigmæus (1), Trombidium (1), Eylais (1), Hydrophantes (1), Thyas (1), Lebertia (1), Laminipes (1), Curvipes (1), Parasitus (1), Galumna (1), and Scutovertex (2).

Chilopoda (pp. 15–22, pl. IV). Two species of Chilopods, one belonging to the Lithobiomorpha, the other to the Geophilomorpha, are the only Myriopods collected by the Expedition, and both were taken in the Cape Nome region, Alaska. Mr. Chamberlin, however, gives a list of all the Alaskan Chilopods (14 species), a key to the genera of the family Chilenophilidæ, and a full description of *Cryophilus alaskanus*. n. gen. et sp. *Ethophilus integer*, n. sp., though not represented in the collection of the Expedition is also described, a subspecies (*alaskanus*) having been reported from Alaska. The typical form comes from Washington and Oregon. E.M.W.

(To be continued).

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